



# Public Health Implications of Excessive Use of the Internet, Computers, Smartphones and Similar Electronic Devices

## Meeting report

Main Meeting Hall, Foundation for Promotion of Cancer Research  
National Cancer Research Centre, Tokyo, Japan  
27-29 August 2014



**World Health  
Organization**



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## Contents

<b>Acknowledgements</b>	4
<b>Report overview</b>	5
<b>Background</b>	5
<b>Meeting objectives</b>	6
<b>Meeting format</b>	6
<b>Overview of the meeting deliberations</b>	7
1. Scope	7
2. Epidemiology	9
3. Comorbidity	11
4. Phenomenology and clinical course	11
5. Clinical descriptions and diagnostic guidelines	13
6. Classification	16
7. Management	16
8. Public policy and health system responses	17
<b>Conclusions</b>	19
<b>Next steps</b>	22
<b>Appendix A: Meeting programme</b>	23
<b>Appendix B: List of participants</b>	25
<b>Management of conflicts of interest</b>	27
<b>Appendix C: Background papers</b>	29

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## Report overview

This report provides a summary of the three-day meeting held in Tokyo on 27-29 August 2014. As described in the **Background** and **Meeting objectives** sections of this report, the meeting was held in order to discuss public health implications of excessive use of the Internet, computers, smartphones and other electronic devices in the context of “behavioural addictions” associated with such excessive use. The term “behavioural addictions” is not part of the official nomenclature used by the World Health Organization (WHO) and, as a diagnostic group, was not included in the 10<sup>th</sup> International Classification of Diseases (ICD-10). However, the term “behavioural addictions” has become increasingly used in the scientific literature and in preparation of the meeting. Hence, the current report uses “behavioural addictions” as the best available term to describe a range of conditions under consideration at the meeting, without prejudice to any future decision regarding its place in WHO nomenclature.

The section on **Meeting format** introduces the eight main topics discussed at the meeting (scope, epidemiology, comorbidity, phenomenology, diagnosis, classification and management of the disorders as well as public health policy and health system responses). It also gives a short overview of the meeting programme and participants, which are listed in full in **Appendix A** and **Appendix B**.

The section titled **Review** focuses on the expert inputs made at the meeting. However, this section is not a detailed summary of each presentation. Background papers related to this section are in **Appendix C**.

Sections titled **Conclusions** and **Next steps** provide an overview of the future direction. In particular, the meeting participants recommended three concrete programme activities for WHO in this area. Some of these activities have already been started at the time of writing this report.

## Background

The use of the Internet, computers, mobile phones, smartphones and other electronic devices has dramatically increased over the last decades in all parts of the world. This may promote public health with respect to provision of information, facilitation of pro-social activities and other factors. However, this increase is also associated with documented cases of excessive use that warrant consideration.

Given that the patterns and extent of use vary widely (at individual and population levels), there is continuing debate on how best to define such excessive use from a public health perspective. Currently, behavioural addictions are usually characterized by often irresistible urge, impulse or drive to repeatedly engage in an activity (non-substance use) and an inability to reduce or cease this behaviour (loss of control) despite serious negative consequences to the person's physical, mental, social and/or financial well-being. Within this context are often considered behavioural disorders or excessive behaviours associated with gambling, viewing pornography, video gaming, internet-based single-player and multi-player gaming, excessive use of various social media, smartphone applications (apps) and similar electronic devices.

The scope of this problem has reached the magnitude of a significant public health concern in some jurisdictions. Others are yet to experience this concern as the use of the Internet and other electronic devices increases further globally. Hence, there is a need to identify feasible and successful public policy and health services responses.

With this in view, the meeting in Tokyo on 27-29 August 2014 was held in order to review available information related to health conditions associated with excessive use of the Internet, computers, smartphones and other electronic devices, including conditions considered as “behavioural addictions”.

## Meeting objectives

The meeting had the following four objectives:

1. Review the available evidence on epidemiology, nature, phenomenology, outcomes and public health implications of health conditions associated with excessive use of the Internet, computers, smartphones and similar electronic devices;
2. Review clinical descriptions and diagnostic guidelines of behavioural addictions associated with excessive use of the Internet and computers in the current classifications systems of mental and behavioural disorders;
3. Review the available public policy and health system responses from different parts of the world including their feasibility, effectiveness, costs and public health benefits;
4. Develop suggestions for WHO’s further programme activities in this area.

## Meeting format

The meeting was conducted over three days in Tokyo, Japan. The meeting programme included 13 plenary sessions structured around the following eight discussion topics (see Appendix A for full programme):

1. **Scope** of health conditions under consideration. Behavioural addictions associated with excessive use of the Internet, computers, smartphones and similar electronic devices. Boundaries with normality. Scope of health and social consequences due to excessive use of the Internet, computers, smartphones and similar electronic devices.
2. **Epidemiology** of disorders associated with excessive use of the Internet, computers, smartphones and similar electronic devices. Measurement challenges. Available epidemiological data.
3. **Comorbid conditions**. Psychosocial factors influencing development and outcomes of the disorders under consideration.
4. **Phenomenology and natural course** of disorders associated with excessive use of the Internet, computers, smartphones and similar electronic devices.

5. **Clinical descriptions and diagnostic guidelines** of disorders associated with excessive use of the Internet, computers, smartphones and similar electronic devices. Diagnostic instruments.
6. Disorders associated with excessive use of the Internet, computers, smartphones and similar electronic devices in the **classifications** of mental and behavioural disorders.
7. Identification and **management** of disorders and health conditions associated with excessive use of the Internet, computers, smartphones and similar electronic devices.
8. **Public policy and health system responses**. Feasibility, effectiveness, costs and public health benefits. Case studies from represented countries.

*Note: for the purposes of readability, the titles of the above meeting sessions have been simplified (based on the text shown in bold) in the main text of this meeting report.*

The meeting was attended by 19 participants and 24 observers (see Appendix B for a full list of participants). Dr Susumu Higuchi (Director of the National Hospital Organization Kurihama Medical and Addiction Centre) was elected as Chair of the meeting.

## Overview of the meeting deliberations

The following section provides an overview of the meeting discussions on each of the eight discussion topics, i.e. scope, epidemiology, comorbidity, phenomenology and clinical course, clinical description and diagnostic guidelines, classification and management as well as public policy and health system responses. Notably, the following section is not a detailed summary of each presentation or of the topic as a whole. Further details on these topics can be found in the background papers provided in Appendix C.

### 1. Scope

Since introduction of the “World Wide Web” in 1990 the availability and use of the Internet and digital technology has considerably increased throughout the world. By now the Internet has become integrated into the occupational, social and recreational parts of most people’s lives. Reported benefits of the Internet and digital technology are vast, including “doing more in less time” and hence having more time for family and friends. Many benefits may directly promote public health, e.g., provision of information and facilitation of pro-social activities.

However, the rising popularity and use of the Internet and electronic devices has also seen an increasing clinical, research and media focus on health problems associated with excessive use. As a result there is an ongoing debate about how best to view the use of Internet and electronic devices from a public health perspective. Such public health debate concentrates on the negative health conditions associated with excessive use of the Internet and modern technologies. Given that the concept is fairly new, the scope of ‘health conditions’ associated with ‘excessive use’ of ‘modern technologies’ is yet to be defined.



### **a) Health conditions under consideration**

Currently, the concept of “behavioural addiction associated with excessive use of the Internet, computers, smartphones and similar electronic devices” is typically based on key features of substance use disorders. Hence, one of the many descriptions of behavioural addictions is the following: an irresistible urge, impulse or drive to repeatedly engage in an action and an inability to reduce or cease this behaviour (loss of control) despite serious negative consequences to the person's physical, mental, social and/or financial well-being.

In the future, the concept needs to be more carefully defined, including potential diagnostic categories and their sub-groups. One way to define the concept in more detail could be to consider three different dimensions: exposure (i.e. duration, frequency, intensity), driving force of behaviours (i.e. dependence), and consequences. The latter of these, i.e. physical, mental, social (and financial) consequences are described in more detail below. Notably, social functioning is normally not part of WHO definitions of dependence or harmful use, but among “internet use disorders” this is one of the key diagnostic features.

### **b) Boundaries with normality**

Boundaries between normal and abnormal (or excessive and pathological) use is challenging to define, because behavioural patterns and the extent of use vary widely between individuals and cultures. Generational effects and social norms are also relevant in defining boundaries with normality for rapidly developing technologies. Moreover, excessive use of the Internet and other related modern technologies may be a cultural phenomenon for which defining boundaries with normality is culture-, time- and occupation-bound.

It is also under debate, whether “excessive use” of the internet and electronic devices should itself be the focus of a new behavioural disorder (with a single clinical representation) or whether the Internet and related modern technologies merely serve as a vector for a wide range of behaviours, e.g., socializing, gaming, gambling, shopping, getting information, pornography-viewing, that can potentially be harmful. In any case, the framework of hazardous use, harmful use and dependence could be considered in the context of excessive use of the Internet and electronic devices.

### **c) Spectrum of modern technologies**

Harmful use of the Internet and modern technologies can relate to a wide range of products and services. These include older types of electronic screen products such as televisions and videos, as well as newer electronic screen products such as computers, smartphones, video game devices and e-books. More research is needed to identify whether different technologies link to different subgroups of the behavioural disorder.

In conclusion, absence of universal definition of scope for this relatively recent phenomenon, including lack of universal terminology and diagnostic criteria, hampers international communication and research in this field.

## 2. Epidemiology

The main objective of this session was to review the available evidence on epidemiology of health conditions associated with excessive use of the Internet, computers, smartphones and similar electronic devices. This section consists of selected examples of currently available data (from background papers included in Appendix C) and an overview of the challenges involved with availability and quality of epidemiology data in this area.

### a) Current data

The most active adopters of the Internet and modern technologies have been adolescents and young adults, reflecting the fact that they have grown up in an environment with a well-developed (widely available, high speed) Internet. This has presumably contributed to higher prevalence estimates for internet use disorders among adolescents and young adults. In Korea internet addiction has been identified as the largest health problem experienced among kids (Ministry of Science, ICT and Future Planning, 2012 Survey of internet use, 2013). In China the highest rate of internet use related problems was 15.6% in the ages of 18-23 (2009 Report on Internet Addiction in Teenagers). Also, in Switzerland problematic internet use (defined as Compulsive Internet Use Scale results of 28 points or higher) reached 6.5% among the 15-19 year age group, but only 0.9% among the general population (see Kuenig et al. in Appendix C). However, use of the Internet and modern technologies is rising also among older populations and hence general population studies are becoming increasingly important.

Prevalence estimates, presented not only vary by age, but also within and between geographies, also depending on screening and diagnostic tools and thresholds used. For example, the prevalence of problematic internet use within Europe ranges from 1% in Norway to 18% in the United Kingdom. In contrast, the range in the United States of America is reported as 0-26% and 7-23% in Hong Kong (Kaye and Farrell, see Appendix C). While these data provide an indication of prevalence of internet related disorders, these values can be questioned due to methodological challenges and inconsistencies described below. In fact, prevalence estimates vary as widely as 0-90%, depending on the country, age group and epidemiological method in question (see e.g., Jiménez-Murcia et al., Kaye and Farrell, Achab et al. in Appendix C). Also, a disproportionate amount of the available epidemiological data on internet use disorders is collected from Asia and Europe. According to Achab et al. (see Appendix C) the vast majority of studies on cell phone addiction are also from Asia and Europe.

In addition to research on internet use disorders and cell phone addiction, social network site addiction has also been studied a little. Hereby, the trends follow internet and cell phone-related data trends. For example, social network site addiction data suggests significantly higher prevalence in Chinese college (34%) than in Nigerian (1,6%) or Peruvian (8,6%) university students (Achab et al, see Appendix C).

Whether there are differences between genders, like in substance use disorders, appears to be a matter of debate. However, data from the Ontario Student Drug Use and Health Survey (OSDUHS; n=5478; grades 7-12) 2013 suggested that the percentage of males responding "Yes" to the nine problem video game playing

(PVP) scale items was significantly higher than the percentage of females saying “Yes” for all nine categories. Data from China also suggested higher internet addiction rates in males (16.9%) than in females (11.3%).

### **b) Availability of data**

There are four key limitations related to the availability of epidemiological data on internet use disorders:

- High availability and use of the Internet and electronic devices makes it convenient to collect data. This can result in elevated prevalence estimates if the type and quality of risk is not sufficiently evaluated (see related comments on measurement challenges below).
- Few studies from general populations means that epidemiological estimates from different countries often reflect a specific sub-population.
- Absence of longitudinal studies makes it challenging to establish causal relationships, co-relationships and explain natural courses.
- Limited qualitative or cross-cultural studies makes it hard to explain the phenomenology.

While lagging decades behind research on substance use disorders, internet gambling and internet gaming are the most studied from so called behavioural addictions. Hence, research on internet gambling and internet gaming may be a good starting point for future research on internet use disorders.

### **c) Measurement challenges**

Where data is available, it varies widely in type and quality. Three common measurement challenges are listed below:

- Most epidemiological studies use questionnaires that are not specific enough to identify true prevalence. In the background paper of Achab et al. (see Appendix C) 21 assessment tools are listed for excessive use of the Internet. These include Chen’s and Young’s Internet Addiction Scales to measure the presence and severity of internet addiction, respectively. These tools are screening instruments but not diagnostic instruments (as there is no international consensus on diagnostic criteria and scope of conditions under conditions). Hence, the used questionnaires are not specific enough to differentiate between screening prevalence and true prevalence. Also, they typically lack sufficient validation at national and international scale. Hence, epidemiological research in this field requires standardized quality and quantity instruments that can define whether a given level and nature of usage has pathological features or the key features of a disorder or a disease (such as the WHO diagnostic instruments “Composite International Diagnostic Interview” (CIDI) or “Schedules for Clinical Assessment in Neuropsychiatry” (SCAN)).
- There is significant heterogeneity in the definition and naming of conditions associated with excessive use of the Internet and electronic devices. Also,

their meanings vary depending on the context. This is creating significant noise and confusion among researchers in this field.

- Many surveys measure screen time, which is technically hard to measure and may not indicate true usage (e.g., due to sleep time settings and multi-screen usage). Moreover, screen time can correlate more clearly with physical than psychological consequences or addiction (see discussion on clinical presentation for suggested list of psychological, physical and social health consequences). Also, screen time may be habitual, education- or work-related, and indicate a cultural phenomenon. Hence, qualitative and cultural research is needed to complement quantitative metrics in order to accurately capture what people do during “screen time”.

The above examples clarify that better scales, surveys, nomenclature and diagnostic guidelines are needed to improve the quality of data in this field of research.

In conclusion, epidemiological research in this field is faced with limited and often unreliable data. Hence, there is an urgent need to generate novel, international-level research, e.g., by designing standard questions/scales/instruments to measure prevalence, quality and quantity of the behaviours that may represent disorder(s). Such future research with comprehensive assessment in the domains of gaming/internet use behaviour, health status and psychosocial functioning may facilitate the development of the assessment and eventually diagnostic instruments for a broad range of activities associated with gaming or internet use.

### **3. Comorbidity**

Data presented at the meeting suggest that individuals with excessive use of the Internet have comorbid psychopathology. However, causal relationships have not been established due to lack of longitudinal data. It seems that attention deficit hyperactivity disorder (ADHD) and particularly major depression are the most common comorbid conditions (see e.g., Kaye and Farrell in Appendix C). In contrast, associations with anxiety, social phobia, obsessive-compulsive disorder and hostility/aggression appear to be significantly weaker. Comorbidity with other health conditions (e.g., substance use disorders, suicidal ideation, schizophrenia and insomnia) has been investigated to a lesser extent.

In addition to comorbidity with psychiatric conditions, excessive use of the Internet and electronic devices typically presents itself together with other physical and psychosocial problems, e.g., back pain, social withdrawal, sleep deprivation, low self-esteem. Hereby the direction of causality and link between the disorders is unclear.

Regardless of the direction of causality, however, comorbidity is likely to complicate the screening, diagnosis and management of internet use disorders. Hence, there is a need for more cohort prospective studies and longitudinal data.

### **4. Phenomenology and clinical course**

“Behavioural addictions associated with excessive use of the Internet, computers, smartphones and similar electronic devices” is an umbrella term that covers a

broad range of conditions which need to be defined and named in a more succinct manner in the future. Notably, the term “behavioural addictions” is not part of the official nomenclature used by the WHO and was used at the meeting and in this report only for convenience. Other commonly used terms for conditions related to excessive use of Internet and electronic devices with signs and symptoms of dependence syndrome and related conditions include “internet addiction”, “internet addiction disorder (IAD)”, “internet use disorder”, “cyber addiction”, “internet gaming disorder (IGD)”, “internet gambling disorder”, “social networking addiction”, “problematic internet use (PIU)” and “compulsive internet use (CIU)”.

Of these concepts, “internet gambling disorder” and “internet gaming disorder” are better described concepts than other so called “behavioural addictions”. However, several meeting participants clarified that disorders demanding treatment in coming years are not limited to gambling and gaming disorders. On the other hand, phenomenological research to date fails to provide clear boundaries between health conditions associated with excessive use of the Internet and the use of e.g., smartphones. Hence, the meeting session on phenomenology and natural course focused on conditions grouped under the term “internet use disorders” with acknowledgement of heterogeneity of conditions grouped under this term and, therefore, challenges in describing their phenomenology and natural history.

The phenomenology and clinical course of internet use disorders is not well described and understood, with most of the documented evidence being in the context of internet gaming disorder or following that of impulse control or substance use disorders. Hence, detailed descriptive interviews with affected individuals (with or without treatment) and their significant others across cultures are needed to better understand the phenomenology and totality of internet use disorders. Even after the taxonomy, phenomenology and natural course of internet use disorders is defined, prevention and treatment interventions need to be developed based on practical experiences and research findings (see discussions below on management and health system responses).

Internet use disorders are reported in children, adolescents and adults, but the time of onset is unclear (estimates vary from 6 months to over 10 years from initial use of the Internet). Several motives have been related to excessive use of the Internet, including “detachment” or “dissociation” (e.g., loss of boundaries and timelessness) and “socializing” (e.g., meeting people online, socializing in a virtual world). Unique motives have been related to online video games (Massively-Multiplayer Online Role-Playing Games, First Person Shooters, Multiplayer Online Battle Arena), including “achievement” (in game advancement and status, competition with peers), “social affiliation” (in game socialization and cooperation, making new relationships), and “immersion” (playing the role of a fictional character, exploring a virtual world, escapism from real life). It is worth noting that motives can be really different from one type of online activity to another.

These motives are believed to drive adolescents’ or young adults’ failure to resist the urge, impulse, craving, drive or temptation to use excessively the Internet – even when it is hazardous or harmful to the person or to others. This leads to a change in saliency hierarchy toward repetitive engagement in (typically) one of the following internet activities:

- [Excessive gaming](#)
- [Internet-based gambling](#)
- [Sexual internet-based preoccupations](#) (e.g. viewing pornography)
- [Socialising or social networking](#) (e.g. emailing, messaging, frequenting “chat” rooms).

The repetitive engagement in any of the above activities ultimately interferes with functioning in multiple domains through excessive use, withdrawal, tolerance and other negative repercussions (see clinical presentation-discussion for details). Some studies suggest that internet use disorders are chronic, relapsing conditions that are resistant to treatment. High relapse rates may, in part, be due to high accessibility of the Internet and the need to use it in daily life, particularly in academic and occupational settings.

In summary, internet use disorders involve a persistent pattern of maladaptive behaviour, which is characterized by either an irresistible preoccupation with, or excessive use of, the Internet for longer periods of time than planned, and leads to clinically significant distress and/or impaired functioning (see Kaye and Farrell in Appendix C for further information on the topic).

## 5. Clinical descriptions and diagnostic guidelines

Elaboration of clinical descriptions, diagnostic guidelines and boundaries with “normality” for internet use disorders and related health conditions will be important for clarifying the scope of the problem, defining clinical utility of diagnostic categories and developing effective interventions as well as for building up the evidence base for future developments. Hence, one of the four meeting objectives was to ‘review clinical descriptions and diagnostic guidelines of behavioural addictions associated with excessive use of the Internet and computers in the current classifications systems of mental and behavioural disorders’. While a review of these topics was possible, meeting participants concluded that results of the review do not provide sufficient evidence and information for making suggestions on diagnostic guidelines, and further work is required to address taxonomy of conditions under consideration, their phenomenology and available evidence of their nature, clinical course and treatment responses.

### a) Clinical presentations

Typical components of what is described as “internet addiction” are the following:

- [Salience/Excessive use](#) - often associated with a loss of or diminished control over the activity and impaired time management (resulting in e.g., use of the Internet for 16 hours or more per day) and/or a neglect of basic needs (e.g. food, sleep)
- [Withdrawal](#) - including feelings of anger, tension, anxiety and/or depression, when the Internet/computers are inaccessible
- [Tolerance](#) - including the need for more hours of use

- [Negative repercussions/Conflict](#) - including self-imposed social isolation and disintegration, lying, arguing, poor academic and occupational achievement and fatigue
- [Craving](#) – including urge and obsessions related to an online activity
- [Mood modification](#) – including the use of online activity to cope with negative emotional states or boredom.

In other words, individuals "addicted" to the Internet focus excessive numbers of hours on internet-related activities at the expense of broader life activities, including those associated with fulfilling the basic needs (e.g., food, sleep, intimate contacts).

Beyond these psychological "addiction"- related consequences, internet use disorders and associated health conditions may present together with physical and social consequences of clinical and public health significance. There is currently no consensus among experts on how wide the scope of health and social consequences under consideration should be. Potential physical and social consequences of excessive use of the Internet, computers, smartphones and other electronic devices are listed below (see full background paper by Department of Health, Hong Kong SAR, China, in Appendix C). The list is not meant to be comprehensive, exhaustive or definitive, but rather highlight areas of public concern. The public health and clinical relevance of below-listed health consequences of excessive use of internet, computers and similar electronic devices will require confirmation by properly designed and implemented studies in the future.

### [Physical health](#)

- **Sedentary lifestyle:** Excessive screen time (associated with e.g., snacking/poor diet, decreased sleep time and insufficient physical fitness) relates to obesity and overweight, as well as other potential health risks.
- **Vision:** Prolonged use of electronic screen products may potentially lead to eye and visual symptoms like ocular discomfort, eyestrain, dry eye, headache, blurred vision and even double vision.
- **Musculoskeletal problems:** Prolonged use of electronic screen products in a fixed posture can cause or exacerbate musculoskeletal symptoms.
- **Hearing:** Electronic devices with audio entertainment functions can typically generate harmful levels of sound, which can be linked to permanent hearing damage.
- **Injuries and accidents:** Mobile electronic devices, such as smartphones, are commonly used while doing other tasks, which may make the user more prone to injuries and accidents.
- **Infections:** Insufficient hygiene precautions and sharing of mobile devices such as smartphones may enable the spread of pathogens and infectious diseases.

## Psychosocial health

- Cyber-bullying: modern technologies and the Internet enable a new type of bullying, namely cyber-bullying, which is associated with a range of serious psychosocial consequences.
- Social development: Spending too much time online and using modern electronic devices may cause social withdrawal and/or hinder social skill development, e.g., through decreased face to face interaction and unreal social interactions online.
- Sleep deprivation: Excessive use of electronic devices relates to sleep deprivation, which affects growth and development in children and adolescents.
- Risky sexual behaviours: Sexual content and increased availability of the Internet and electronic devices may increase risky sexual behaviour.
- Aggressive behaviours: Violent content of videos and online games may have adverse effects on the behaviour of children, adolescents and adults.
- Other social and psychological problems: Excessive use of the Internet and electronic devices can be associated with a range of social and psychological problems such as poor psychological well-being, poor self-confidence, family problems, marital breakdown, reduced work and academic performance.

For some of the consequences listed above, there remains limited evidence to link them to long-term use of electronic devices. Hence, it is possible that disorders associated with excessive use of electronic devices are eventually defined more narrowly than the above list of health consequences suggests.

It is likely that future diagnostic criteria for internet use disorder (to be defined) may not represent the totality of the problem, but rather the features that are most reliably or easily measured.

### **b) Diagnostic guidelines**

There is continuing debate about whether internet use disorders and related health conditions represent a reasonable, independent diagnostic entities (rather than, e.g. a medium for presentation of other psychiatric conditions) and, if so, how best to define them. Diagnostic criteria for internet addiction typically assume that the following features are the same for substance use disorders and internet addiction: salience (i.e., a preoccupation with the activity, which dominantly occupies cognitive and emotional processing and behaviour), mood modification (e.g. euphoria), withdrawal, tolerance, conflict and relapse. However, this approach is fairly generic across addictions, and may as such not sufficiently reflect specific features of internet use disorders (e.g., “immersion” could be a unique feature for internet gaming disorder). Also, conceptualization of addiction as any excessive behaviour may oversimplify the individual and psychological consequences under consideration (see Achab et al in Appendix C). Hence, the currently proposed



descriptions, diagnostic categories and diagnostic criteria for internet use disorders and related health conditions need to be revisited and elaborated as soon as possible.

## **6. Classification**

Pathological gambling was introduced as a disorder of impulse control in the 3<sup>rd</sup> Diagnostic and Statistical Manual (DSM-3; American Psychiatric Association, 1980), suggesting an intrapersonal difficulty to control one's actions (see discussion above on clinical course). Based on clinical and phenomenological similarities, comorbidity, comparable treatment response and neurobiological findings with substance use disorders, pathological gambling is included into the category of substance-related and addictive disorders in DSM-5 (see Jiménez-Murcia et al in Appendix C). After reviewing similar evidence for internet gaming disorder, this is also included in DSM-5 Section 3, i.e., "a condition warranting more clinical research and experience before it might be considered for inclusion as a formal disorder". Internet addiction disorder (also called problematic internet use or compulsive internet use) will not be included in DSM-5 due to insufficient data on the topic (see background paper by Potenza in Appendix C).

World Health Organization is currently in the process of developing ICD-11 which gives an opportunity to incorporate the latest developments related to internet use disorders and related health conditions into the draft ICD-11 provided that consensus is built up with regard of diagnostic categories, their clinical descriptions and diagnostic guidelines, and their clinical and public health utility is confirmed in the process of field testing.

If "internet use disorder" is eventually included in ICD-11, it's diagnostic criteria may significantly overlap with those for substance use disorders and pathological gambling. The relationships between "internet use disorders", "internet gaming disorder" and "gambling disorder" are yet to be investigated.

Regardless as to whether internet use disorder is eventually considered as mental and behavioural disorder or not, the currently available evidence and information indicate that excessive use of internet and related modern technologies may result in health conditions which are similar to substance use disorders in their phenomenology, clinical course and neurobiological basis, which has important public health and public policy implications.

## **7. Management**

The meeting reviewed available information on risk factors and potentially effective prevention and management strategies related to excessive use of the Internet and electronic devices. However, in view of heterogeneity and insufficient knowledge about the diagnostic entities under consideration (see discussion above on scope and epidemiology), any conclusions regarding effective interventions may be premature.

### **a) Individual risk factors**

A range of psychobiological and psychosocial risk factors associated with excessive use of the Internet and electronic devices were reviewed at the meeting.

Psychobiological risk factors include personality and temperament-related factors (e.g., neuroticism, impulsivity, low self-esteem and introversion) as well as mechanisms related to self-regulation (e.g., poor decision-making under uncertainty and risk, impaired inhibitory control). In addition to psychobiological risk factors, psychosocial risk factors such as negative life events, poor academic/professional performance and comorbidities were reviewed. It may be helpful to differentiate between psychosocial risk factors among adolescents (e.g., poor social relations at school) and adults (e.g., low job satisfaction and unhealthy behaviours). These risk factors should be the focus of preventative and early identification measures among at-risk individuals and their families.

#### **b) Management strategies**

Treatment interventions that also aim to reduce the psychosocial problems related to internet use disorders and excessive use of the Internet and electronic devices include Cognitive Behavioural Therapy (CBT), group therapy, family therapy, and pharmacotherapy (often targeting comorbid conditions such as ADHD, anxiety and mood disorders). Depending on the country, these services are provided by the health, education and/or communication sector and may include both governmental and non-governmental players. Interventions are provided in communities or in health facilities like hospitals or health centers (but rarely in the primary health care settings). In either case, there is typically no systematic referral system.

In addition to interventions focusing on behaviours and psychological problems, it is also relevant to tackle physical and social consequences of excessive use of the Internet and electronic devices (see discussion on clinical presentation for a suggested list of psychological, physical and social consequences).

### **8. Public policy and health system responses**

Public policy and health system responses for implementation at different levels (e.g., municipal, national, regional, global) were discussed for the majority of Meeting Day 3 and the topic was discussed from multiple angles. It was noted that the increasing availability and use of the Internet, internet-based technologies and electronic devices have brought significant benefits to multiple life domains of most internet users. However, this increasing use of Internet and electronic devices is associated with increasing number of people experiencing problems and higher risks of developing internet use disorders and associated conditions. Hence, public prevention policies and interventions are justified and already implemented in countries where internet use disorders are considered as clinical conditions and emerging public health problem. Such policies and interventions are expected to be developed and implemented in other jurisdictions as soon as the increasing rates of Internet penetration and use of smartphones and similar electronic devices result in a significant number of individuals suffering from their excessive and harmful use.

#### **a) Public policies**

Regulations on use of the Internet through public policy and users themselves are becoming more common in parallel with increased use of the Internet worldwide. Effectiveness of these measures has not been measured in a systematic manner, because the phenomenon is relatively new. The main challenges related to feasibility of public policies are the following:

- Unfavourable public perception, e.g. due to
  - Lack of public awareness of the problem (e.g., due to low availability of the Internet and electronic devices)
  - Cultural differences
  - Differences in lifestyle (e.g., differences in popularity of games)
  - Potential impact on social activities.
- Poorly established terminology
- Commercial needs of the relevant economic operators (e.g., gaming and gambling industries)
- Divided responsibilities within governments (communication, education and health).

On the topic of divided responsibilities, meeting participants felt that while responsibilities are divided, the public health sector should take primary responsibility for action related to this topic.

Examples from South Korea and Hong Kong SAR China presented at the meeting highlighted the wide-ranging perceived benefits of increased government prevention activities in this area (e.g., due to high prevalence of internet use disorders and associated conditions, seriousness of consequences and harm to others), as well as presented an estimate of the direct (e.g., treatment, usage fees) and indirect (e.g., loss of productivity) socioeconomic costs of the problem in South Korea.

#### **b) Health system responses**

Health system responses have been implemented to a lesser extent than public policies regulating the availability of the Internet and electronic devices, but special treatment programmes for internet use disorders and associated conditions are being established in many countries around the world either integrated with services for mental health and/or substance use disorders or stand-alone services. A significant barrier for their further development is the lack of universal diagnostic criteria and, therefore, solid evidence of effectiveness of prevention and treatment interventions (see above for detailed discussion). Additionally, the feasibility of health system responses is challenged by limited health insurance coverage in many countries.

#### **c) Examples from countries**

Many of the currently implemented public policies are very similar to policies used for reducing health risks associated with psychoactive substance use and gambling, such as regulating product development, regulating availability and accessibility (e.g., age and time-of-day limits) as well as implementing restrictions on marketing and advertisements. Some countries also have particular government bodies responsible for internet safety. However, these entities typically do not deal with health consequences.

Country examples for national information policies and strategies include the regional "Gamer guard" in Thailand, and the "Fatigue system" policy in China, whereby players gain no experience points in the game of choice after 5 hours of playing. Examples of integrated national plans and policies include Belarus' governmental programme for treatment of internet dependence and South Korea's 2nd master plan for prevention of internet addiction. The latter case example was discussed in detail at the meeting and includes:

- Policies that relate to the content of services, e.g., the "Game Industry Promotion Act" requires that all game material is presented and rated by the Game Rating Board.
- Policies that protect vulnerable individuals, e.g., based on the "Juvenile Protection Act" people suffering from internet addiction receive education and counselling according to their individual levels of risk.
- Plans to setup 12 community-based internet addiction response centers. 45 "Wee" centers, 3 Counseling/therapy centers for internet gaming disorder, Addiction Supervision Centers, and the "RESCUE School" boarding institute for recovery.
- Policies to limit accessibility, such as the Health Internet Game Policy and the Nighttime Shutdown Policy, which force online games providers to shutdown their services for teenagers under 16 from midnight to 6am, as well as the Fatigue System (similar to that in China). Interestingly, the Selective Shutdown Policy was also prepared in 2013, but this voluntary shutdown request by teenagers under 18 or their legal guardians (which games providers must abide with) is rarely used. Also, the Cooling Off Policy, which would put restrictions on the amount of time spent playing games by minors between the age of 6 and 18, was eventually discarded.

An important conclusion from the sessions on public policy and health system responses was that policy and programme responses to internet use disorders involve multiple sectors and different levels of societal responses which are very similar to societal responses to substance use disorders, and sufficient resources and commitment are needed for monitoring the situation and associated public health risks at different levels. Moreover, documenting current policy and programme responses should include exploration on the feasibility, effectiveness and cost-effectiveness of different policy options.

## Conclusions

The review of available evidence on internet use disorders and excessive use of the Internet and electronic devices identified important gaps to be filled in coming years. Despite these caveats, the meeting concluded that rapidly increasing use of the Internet and electronic devices with enormous benefits for societies and different domains of a person's life can also result in health consequences which are of concern from a public health perspective. The observed and documented negative health and psychosocial consequences include a range of health conditions that share signs and symptoms with disorders such as gambling disorder and substance use disorders. These problems of public health concern and importance have already been recognized in many countries, which have led

particularly governments to look for effective prevention policies and response strategies aimed at reducing health risks and consequences associated with excessive use of Internet and electronic devices.

Meeting conclusions can be summarized under three major themes:

1. *Need to conceptualize and define the scope, phenomenology and typology of disorders associated with excessive use of Internet, computers, smartphones and similar devices which have shared signs and symptoms with substance use disorders and "behavioural addictions".* Whenever possible, international consensus regarding diagnostic entities under consideration, as well as their clinical descriptions and diagnostic guidelines should be developed. For this purpose meeting participants suggested that WHO continues its efforts on building up international consensus and convenes an international expert meeting to address taxonomy, clinical and public health utility and diagnostic boundaries of disorders associated with excessive use of the Internet and electronic devices.
2. *Need for intensifying international research to address current knowledge gaps and to generate essential needed information for development of prevention and treatment policies, strategies and interventions.* This international research should involve both developed and less-resourced countries from different parts of the world. Key research areas for consideration are the following:
  - Health and social consequences and associated disease, social and economic burden
  - Phenomenology, natural course and diagnostic boundaries of disorders and their sub-groups
  - Harm to others, including impact on health and well-being of families and significant others
  - Effectiveness and cost-effectiveness of preventive and treatment strategies, policies and interventions.

In order to improve understanding of this public health problem from many perspectives, future research should utilize all of the following tools and channels:

- Population-based and other surveys, e.g., adult surveys, school surveys, mental health surveys and national gambling surveys
- Regularly collected population-based data using standardized and validated instruments and data collection tools, coupled with a new set of standardized questions
- Registry systems within health care services whenever feasible and appropriate (including follow-up data), to document and monitor scale of the problem, age and gender distribution of cases, health and social consequences of conditions and medical costs involved.

It was suggested that WHO convenes an expert meeting to identify priorities for international research and explore possibilities for developing and supporting international research projects outlined above, including the work on designing and validating a standardized instrument to measure prevalence and health impact of excessive use of Internet and electronic devices. For this purpose, partnerships and collaboration agreements can be sought, as appropriate, with other international organizations (e.g., World Bank, ITU, UNESCO, UNICEF, global cooperates), national institutions and private companies with due diligence to conflict of interests in case of potential public-private collaboration or partnerships.

3. *Need for documenting and evaluating policies, strategies and interventions aimed at preventing and reducing health risks and disorders associated with the relatively new phenomenon of excessive use of the Internet and electronic devices.* Suggested activities include the following:

- Document, compile and share case studies, experiences and relevant data on developing and implementing public policy and health system responses in different countries in order to inform future policy and programme developments
- Explore cultural and health system contextual factors and their role in developing and implementing public health policies and responses in this area
- Support monitoring and evaluation of implemented policies and programmes, including appropriate surveillance strategies using standardized instruments and data collection tools for population-based surveys
- Raise public awareness of health problems associated with internet use disorders and excessive use of internet, computers and similar electronic devices, also for enabling early identification (e.g., how to identify the problem; what support services are available; what are potential health risks and harms associated with excessive use of the Internet and modern technologies, and what are available prevention approaches and treatment interventions)
- Document and support development of a comprehensive health service response to demand for treatment and psychosocial support involving community-based interventions, several response layers with appropriate referrals and support services for significant others such as families and friends of affected individuals.

Meeting participants suggested that WHO could encourage and support international networking and evaluation research, as well as activities on documenting and disseminating examples of societal responses.

## Next steps

The meeting concluded by discussing the future direction and agreed on the following next steps:

- An international expert committee will develop a standardized questionnaire to measure scope and impact of excessive use of the Internet, computers, smartphones and similar electronic devices. This work will be leveraged to formulate a set of questions to be included in ICD-11 field-testing.
- Actors from wide range of fields such as health, technology, and communications must work together to define and measure this public health problem as well as to implement interventions.
- Countries that are yet to experience public health concerns related to excessive use of the Internet, computers, smartphones and similar electronic devices due to less use of the Internet and other electronic devices should be alerted of the public health risks involved.

As summarized below, some of the next steps listed above have already been refined at the time of writing this report:

- WHO Collaborating Centre, National Hospital Organization Kurihama Medical and Addiction Centre (led by Dr Susumu Higuchi) will take the lead in gathering a more comprehensive evidence base on behavioural addictions associated with excessive use of the Internet, computers, smartphones and similar electronic devices by end of 2016.
- A WHO meeting will be organized in Seoul, South Korea in Mid 2015 to discuss the scope of the problem and joint priorities for international research.
- A WHO meeting will be organized in 2016 in Hong Kong to discuss public policy and health services responses.

## Appendix A: Meeting programme

**Note:** for the purposes of readability, the titles of meeting sessions have been simplified in the main text of this meeting report.

### Day 1: Wednesday, 27 August 2014

Time	Session	Facilitators/Presenters
09.00-09.45	Welcome remarks: Government of Japan and WHO - Introduction of participants - Objectives of the meeting - Conflicts of Interests	Dr S. Higuchi Dr V. Poznyak Dr X. Wang
09.45-10.40	Scope of health conditions under consideration. Behavioural addictions associated with excessive use of Internet, computers, smartphones and similar electronic devices. Boundaries with normality. Scope of health and social consequences due to excessive use of Internet, computers and similar electronic devices.	Dr M. Potenza Dr Th. Chung
10.40-11.00	Coffee/tea	
11.00-12.30	Epidemiology of disorders associated with excessive use of Internet, computers, smartphones and similar electronic devices. Measurement challenges. Available epidemiological data.	Dr Y. Osaki Dr Y. Rehm Dr H.-J. Rumpf
12.30-13.30	Lunch	
13.30-15.30	Comorbid conditions. Psychosocial factors influencing development and outcomes of the disorders under consideration.	Dr H. Nakayama Dr J. Billieux
15.30-15.50	Coffee/tea	
15.50-17.30	Phenomenology and natural course of disorders associated with excessive use of Internet, computers, smartphones and similar electronic devices.	Dr M. Farrell Dr J. Saunders

### Day 2: Thursday, 28 August 2014

Time	Session	Facilitators/Presenters
09.00-10.40	Clinical descriptions and diagnostic guidelines of disorders associated with excessive use of Internet, computers, smartphones and similar electronic devices. Diagnostic instruments.	Dr J. Saunders Dr S. Higuchi
10.40-11.00	Coffee/tea	
11.00-12.30	Disorders associated with excessive use of Internet, computers, smartphones and similar electronic devices in the classifications of mental and behavioural disorders.	Dr W. Hao Dr M. Potenza Dr V. Poznyak
12.30-13.30	Lunch	
13.30-15.30	Identification and management of disorders and health conditions associated with excessive use of Internet, computers, smartphones and similar electronic devices.	Dr J. Billieux Dr M. Farrell
15.30-15.50	Coffee/tea	
15.50-17.30	Epidemiology, identification, classification and management: conclusions and recommendations <sup>1</sup>	All



### Day 3: Friday, 29 August 2014

Time	Session	Facilitators/Presenters
<b>09.00-10.40</b>	Public policy and health system responses. Feasibility, effectiveness, costs and public health benefits. Case studies from represented countries.	Dr V. Chotpitayasunondh Dr Th. Chung□ Dr M. Farrell□ Dr Hae Kook Lee Dr W. Hao□ Dr V. Poznyak Dr R. Ray□ Dr J. Rehm Dr X. Wang
<b>10.40-11.00</b>	Coffee/tea	
<b>11.00-12.30</b>	Public policy and health system responses (continued).	All
<b>12.30-13.30</b>	Lunch	
<b>13.30-15.30</b>	Public policy and health system responses: conclusions and recommendations.	All
<b>15.30-15.50</b>	Coffee/tea	
<b>15.50-17.00</b>	Conclusions, next steps and closure of the meeting.	Dr X. Wang Dr V. Poznyak Dr S. Higuchi

## Appendix B: List of participants

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## **Management of conflicts of interest**

All meeting participants completed the WHO declaration of interests form that were reviewed by the secretariat. Professor Marc Potenza had received honoraria from non-commercial entities for presentations on behavioural addictions that included sections of talks on internet use and video-gaming at academic conferences and meetings. Also at the time of the meeting M. Potenza was under contract with Oxford University Press to co-edit a book on Digital Technologies and Mental Health. In view of these declared competing interests M. Potenza did not participate in decision-making related to conclusions of the meeting. No other conflicts of interest were declared among participants.



## Appendix C: Background papers

This appendix contains ten background papers that were considered at the meeting held in August 2014. Notably, this is not a comprehensive list of key papers and studies on behavioural addictions associated with excessive use of the Internet, computers, smartphones and similar electronic devices.

- Achab, S., Meuli, V., Deleuze, J., Thorens, G., Rothen, S., Khazall, Y. and Zullino, D. 'Challenges and trends of identification and treatment of disorders associated with problematic use of Internet'.
- Chung, T., Hong Kong SAR, China. 'Internet-related Health Problems'.
- Jiménez-Murcia, S., Fernández-Aranda, F. and Achab, S. 'Excessive use of smartphones and social networks and its impact on health'.
- Kaye, S. and Farrell, M. 'Disorders associated with excessive use of internet, computers, smartphones and similar electronic devices'.
- Kuendig, H. 'Brief summary of policy and programme responses, in Switzerland, to the growing problem of excessive use of internet/smartphones/other electronic devices'.
- Potenza, M. 'Internet Use From a Public Health Perspective: Problems and Promise'.
- Ray, R., Sharma, M., Singh Balhara, Y.P. 'Internet and Smartphone Addiction: Public Health Implications in Indian Context'.
- Rumpf, H.J. Internet addiction: Diagnostic approaches and epidemiology.
- Saunders, J. 'Substance Dependence and Addiction in ICD 11: A discussion paper'.
- Wei, H., Fauth-Buller M., Mann, K. 'The Concept and Position of Behavioural Addiction in the Classification of Mental Disorders'.



## Challenges and trends of identification and treatment of disorders associated with problematic use of Internet

Sophia Achab<sup>1,2</sup>, Vania Meuli<sup>3</sup>, Jory Deleuze<sup>4</sup>, Gabriel Thorens<sup>5</sup>, Stephane Rothen<sup>6</sup>, Yasser Khazaal<sup>7</sup>, Daniele Zullino<sup>8,2</sup> and Joël Billieux<sup>9</sup>

### Introduction

Excessive Internet use is yet subject of debate in the scientific community. What hides this appellation, the legitimacy of its recognition as a mental and addictive disorder, its identification, its impact on individuals and society, and finally its prevention and treatment, remain controversial. Nevertheless, the extent of the phenomenon (e.g. millions of adolescents estimated to be in need for treatment) (1) and the mediated related deaths (2) and crimes (3) are drawing a scaring statement. Another frightening issue is the related negative consequences on social functioning and health. Antisocial behaviours related to Internet addiction in adolescents have been discussed in a recent paper (4), and social functioning impairment (i.e. family problems, poor academic performance, limited leisure activities, negative impact on work, friendships and affective relationships) has been reported in teens (5-7) and in adults (8, 9). Psychiatric disorders (i.e. depression, ADHD, obsessive compulsive symptoms, anxiety disorder and substance use disorders) (10-12) have been reported to be significantly associated with Internet Addiction disorder (IAD). In this context, some countries began to consider it as a serious public health issue (13).

Internet is a vector of a wide variety of activities (e.g. socializing, gaming, buying, getting information) and it makes no sense then to consider its problematic use as a single entity with a single clinical expression. Davis (14) defined two different types of problematic Internet Use (PIU), generalized PIU and specific PIU. The first one refers to multidimensional PIU and the second one to PIU related to specific areas of the Internet. This last type could be duplication through the vector Internet of problematic behaviours that were known before the emergence of this new technology (e.g. online pathological gambling) or it could be problematic novel behaviours (i.e. problem chatting).

Generalized PIU can be explained by the fact that Internet is a technologic tool that has addictive properties comparable to those of drugs (15). To support this theory an online game has been compared to tobacco smoking, finding similar mechanisms of addiction promotion. The *addictive products* (comparable to nicotine) are the salient stimuli delivered in game that trigger the reinforcement process (15). Several significant rewards (e.g. social acceptance, cooperative social interactions, humour, social hierarchies, and monetary gains) are therefore proposed to the gamer. This addictive product is carried by the software (i.e. the game) that is the *first-order vector*, as tobacco leaves are for nicotine (15). Conditioning operates via in game stimuli being delivered in a scheduled manner (continuous and intermittent rewards), reinforcing the gamer in a positive or negative way and then, maintaining gaming behaviour (15). The game is made available in a large extent (i.e. accessible, affordable, easy to use and fast) through technology (i.e. Internet and Smartphone) that constitutes the *second-order vector* comparable to cigarettes (which brings tobacco and nicotine to the consumer)(15).

The aim of this paper is to expose and discuss how PIU is identified in the lack of gold standard and the way it is treated in the lack of best practice consensus.

### Identification

The first arising question when referring to excessive use is “how much is too much?” To address this issue, amount of time spent online can be considered as indicator, but not the only parameter into account. In fact, excessive use has to be differentiated from passionate or extensive engagement in

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pleasurable activities. This distinction can be partially made by considering the subject functioning impairment related to his Internet use and his and/or his social environment suffering. Time spent online has been found to be correlated to Internet addiction in an exploratory study (8), but the cut-off of an at-risk amount of time online is hard to find due to other interacting factors. Internet addiction assessment has been found to be consistent with self-perceived excessive engagement in online activities and correlated to self-reported suffering (e.g. experiencing sleep deprivation or diurnal sleepiness, feeling more irritable less calm or more sad, experiencing marital family work and/or financial difficulties, and suffering from psychological and/or or physical effects) (8). High involvement in online activities is not necessarily associated with a negative impact upon daily living, as suggested by a recent longitudinal study in online gamers (16) and the PIU assessment should be based on multi-factorial criteria.

The second question arising is “is it a homogeneous entity?” Davis (14) was the pioneer in distinguishing theoretically the generalized PIU from the specific PIU. This hypothesis has been tested in adult online gamers, comparing the assessment of Internet addiction to online gaming addictions in the same sample (8). Results showed a similar trend with a statistical association and concordance but also significant divergences between the specific and non-specific PIU instruments (8). Heterogeneity has also been described in the same online problematic activity with different psychological and engagement profiles of gamers (17).

Other questions arising are “is it a symptom or a disorder?” and if a disorder, “is it a primary or a secondary disorder?” It remains unclear whether the PIU is a mental disorder and further research is needed to address this issue. This goes in line with the APA recommendation on Internet Gaming Disorder included in the appendix of the DSM-5 new classification (18). Regarding the co-occurrence of psychiatric disorders, longitudinal studies are needed to clarify if PIU is the primary or the secondary disorder.

#### *Screening tools*

Different attempts have been made to find assessing tools for excessive use of the Internet, and a recent paper summarized 21 of them, describing their structure, their criteria, their cut-off and discussed their weaknesses (**Table 1**) (19).

**Appendix C Meeting on  
Public Health Implications of Behavioural Addictions Associated with Excessive  
Use of the Internet, Computers, Smart Phones and Similar Electronic Devices**

**Table 1. Assessment tools for internet addiction (Kusset al 2014) (19)**

Study	Instrument	Structure	Addiction classification and criteria	Cut-off	Problems
Young, 1998a	Internet Addiction Test (IAT)	20-item self-report scale rated on a Likert scale ranging from 1 (“not at all”) to 5 (“always”)	Criteria for substance dependence and pathological gambling (American Psychiatric Association, 1994): loss of control, neglecting everyday life, relationships and alternative recreation activities, behavioural and cognitive salience, negative consequences, escapism/mood modification, and deception	- Score of 70-100: significant problems - Score of 40-69: frequent problems	- No temporal dimension - Cut-offs arbitrary
Young, 1998b	Internet Addiction Diagnostic Questionnaire (IADQ)	8-item self-report measure scored dichotomously	Based on the diagnostic symptoms of pathological gambling (American Psychiatric Association, 1994): preoccupation, tolerance, loss of control, withdrawal, negative consequences, denial, and escapism	Endorsing 25/8: Internet addiction	- No equivalents for PG criteria committing illegal acts to finance the behaviour and reliance on others for money - Dichotomous scoring
Chen <i>et al.</i> , 2003	Chen’s Internet Addiction Scale (CIAS)	26-item self-report measurement scored on a 4-point Likert scale	Core symptoms of Internet addiction, tolerance, compulsive use, and withdrawal, as well as related problems in terms of negative impact on social activities, interpersonal relationships, physical condition, and time management	- Liberal scoring: 63/64, - Conservative: 67/68 indicates Internet addiction	Different cut-offs used for classification
Meerkerk <i>et al.</i> , 2009a	Compulsive Internet Use Scale (CIUS)	14-item unidimensional self-report questionnaire rated on a 5-point scale	Based on the DSM-IV-TR diagnoses for substance dependence and pathological gambling (American Psychiatric Association, 2000): loss of control, preoccupation, withdrawal symptoms, coping/mood modification, and conflict (inter- and intrapersonal)	N/A	- No cut-off - No assessment of tolerance
Caplan, 2000	Generalized Problematic Internet Use Scale (GPIUS)	29-item self-report questionnaire rated on 5-point Likert scale	Based on Davis’ (2001) cognitive-behavioural model of problematic Internet use; measures mood alteration, perceived social benefits online, negative consequences of and compulsive Internet use, excessive amounts of time spent online, withdrawal, and perceived social control online	N/A	Not all items relevant for addiction classification
Caplan, 2010	Modified Generalised Problematic Internet Use Scale (GPIUS2)	15-item self-report questionnaire rated on 8-point Likert scale	Similar to GPIUS (Caplan, 2000), but includes 2 additional factors: preference for online social interaction and deficient self-regulation (as higher-order factor impacting upon cognitive preoccupation and compulsive Internet use), and the previous factors social benefits and social control were combined	N/A	Not all items relevant for addiction classification
Kim <i>et al.</i> , 2008	Internet Addiction Proneness Scale - Short Form (KS-Scale)	20 items scored on a 4-point Likert scale	Criteria: tolerance, withdrawal, addictive automatic thoughts, disturbance of adaptive function, deviate behaviours, and virtual interpersonal relationships	- Scoring 2 52/80: high risk for Internet addiction - Scoring 48-52: potential risk	Not all items relevant for addiction classification

**Appendix C Meeting on  
Health Implications of Behavioural Addictions Associated with Excessive Use  
of the Internet, Computers, Smart Phones and Similar Electronic Devices**

**(Table 1) Continued**

Study	Instrument	Structure	Addiction classification and criteria	Cut-off	Problems
Lopez-Fernandez <i>et al.</i> , 2013	Problematic Internet Entertainment Use Scale for Adolescents (PIEUSA)	30 items rated on a 7-point Likert scale	Based on DSM-IV-TR criteria for substance dependence and pathological gambling disorders: assesses symptom experience over last 12 months	N/A	No cut-off
Xuet <i>et al.</i> , 2012	DRM 52 Scale of Internet Use	Includes direct and indirect questions organised into 52 items assessed on a 5-point Likert scale	Adapted from Young's Internet Addiction Scale (Young, 1996a); criteria: tolerance, withdrawal, planning, lack of control, time-consuming, socialisation, and negative life consequences because of Internet use	Scoring >163/260 indicates Internet addiction	Not all items relevant for addiction classification
Beranuy <i>et al.</i> , 2009	Questionnaire on Internet-Related Experiences (CERI)	10 questions scored on a 4-point Likert scale	Criteria: interpersonal and intrapersonal conflicts	N/A	No use of recognised diagnostic criteria
Sun <i>et al.</i> , 2010	Compulsive Internet Use Scale (CIUS)	4 items on 5-point Likert scale	Based on Davis <i>et al.</i> 's (2002) Online Cognition Scale	Scoring mean of 4/possible 5: Internet addiction	No use of recognised diagnostic criteria
Liu <i>et al.</i> , 2011	Problematic Internet Use Scale (PIU)	6 items scored dichotomously	Based on Minnesota Impulsive Disorder Inventory (Grant, Levine, Kim, & Potenza, 2005)	Endorsing craving, withdrawal, abstinence attempts simultaneously: problematic Internet use	Overly simplistic classification
Bener <i>et al.</i> , 2011	Excessive Internet use	Daily hours spent online	Length of daily Internet use	Spending 2 3hours on-line/daily: excessive Internet use	Overly simplistic classification
Mythily <i>et al.</i> , 2008	Excessive Internet use	Daily hours spent online	Length of daily Internet use	Spending 2 5hours on-line/daily: excessive Internet use	Overly simplistic classification
Wölfling <i>et al.</i> , 2010	Assessment for Computer and Internet Addiction-Screener (AICA-S)	16 items scored on 5-point Likert scale	Based on diagnostic criteria of substance dependence by DSM-IV-TR (American Psychiatric Association, 2000) and ICD-10 (World Health Organization, 1992); criteria: craving, tolerance, withdrawal, loss of control, preoccupation and negative consequences concerning poorer health, family conflicts or deteriorating achievements, mood modification	Scoring 2 13.5/27: Internet addiction	Lack of time criterion
Thatcher & Goolam, 2005	Problematic Internet Use Questionnaire (PIUQ)	20 items scored on 5-point Likert scale	Based on Young's criteria for Internet addiction (1996b) and the South Oaks Gambling Screen (Lesieur & Blume, 1987), assesses online preoccupation, adverse effects, and online social interactions	N/A	Not all items relevant for addiction classification

**Appendix C Meeting on  
Health Implications of Behavioural Addictions Associated with Excessive Use  
of the Internet, Computers, Smart Phones and Similar Electronic Devices**

**(Table 1) Continued**

Study	Instrument	Structure	Addiction classification and criteria	Cut-off	Problems
Demetrovics <i>et al.</i> , 2008	Problematic Internet Use Questionnaire (PIUQ)	30 items scored on a 5-point Likert scale	Based on the Internet Addiction Questionnaire (Nyikos, Szeredi, & Demetrovics, 2001) and the Internet Addiction Test (Young, 1998a), assesses obsession, neglect and control disorder	- Scoring > 2SD above mean: significant problems because of Internet use  - Scoring 1-2SD above mean: problematic Internet use	Overly simplistic classification, lacks some addiction criteria
Ceyhan <i>et al.</i> , 2007	Problematic Internet Use Scale (PIUS)	33 items scored on 5-point Likert scale	Factors: negative consequences, social benefit/comfort, and excessive usage	N/A	Overly simplistic classification, lacks important addiction criteria
Huang <i>et al.</i> , 2007	Chinese Internet Addiction Inventory (CIAI)	42 items scored on 5-point Likert scale	Based on Young's Internet Addiction Test (1998a), 3 dimensions of Internet addiction: conflicts, mood modification, and dependence; classification based on "5+3" principle (Beard & Wolf, 2001)	For diagnosis, all of the following must be endorsed: preoccupation, tolerance, lack of impulse control, mood modification, increasing usage, and 2 of conflict, lying to others, and escaping from problems	N/A
Bergmark <i>et al.</i> , 2011	Indicators of Internet addiction	Presence of 5 indicators rated on 4-point Likert scale	Indicators: time spent online, family conflicts due to Internet use, withdrawal symptoms, neglect of needs, and unsuccessful abstinence attempts	N/A	- Likert-scale scores converted to binary measures  - Not all items relevant for addiction classification used
Beutel <i>et al.</i> , 2011	Problems because of Internet use	Number of problems due to Internet use	Problem areas: work, school, family, partnership, finances, recreational activities, health-related	N/A	No use of recognised diagnostic criteria

Table 2. Assessment tools for pathological video-gaming (King et al.2013)(20)

Instrument	Author	Components (N: Name)	Items	Time (min)	Age level (years)	Item sensitivity	Time-scale	Diagnostic categories	Country of Origin	Language
Adapted DSM-IV-TR criteria for pathological gambling	American Psychiatric Association (2000)	1: Preoccupation; tolerance; loss of control; withdrawal; escape; chasing; lies; illegal acts; negative consequences; bail out	10/11	3-5 min	8+	Yes/No	12 months	Pathological: $\geq 4/5$ criteria	United States	English
Adapted DSM-IV-TR criteria for substance dependence Addiction-Engagement Questionnaire (e-vised)	American Psychiatric Association (2000) Charlton and Danforth (2007)	1: Loss of control, negative consequences of use 2: Addiction; engagement	7 24	3-5 min 10-15 min	NR NR	Yes/No 7-point	12 months NR	Addicted: $> 3$ criteria Addicted: $> 4$ out of 7 "core" addiction criteria; highly engaged; 1 or 2 "peripheral" addiction criteria plus/3 core addiction criteria None	United States United Kingdom	English English
Compulsive Internet Use Scale (CIUS)	Meerkerk, Van den Eijnden, Franken, and Garreben (2006)	1: Loss of control; preoccupation; withdrawal; conflict; coping	14	10-15 min	NR	5-point	NR	None	The Netherlands	English; Dutch
Engagement-Addiction Questionnaire	Danforth (2003)	1: Engagement [tolerance; euphoria; cognitive salience]; addiction [behavioral salience; conflict; withdrawal]	19	10-15 min	8+	6-point	NR	NR	United Kingdom	English
Exercise Addiction Inventory (adapted)	Hussain and Griffiths (2009)	NR	6	5-10 min	NR	5-point	NR	At-risk of addiction: $\geq 24$ out of 30	United Kingdom	English
Game Addiction Scale (GAS)	Lemmens et al. (2009)	1: Salience; tolerance; mood modification; withdrawal; escape; conflict; problem	7/21	10-15 min	12+	5-point	6 months	Addicted: at least "3; Sometimes" on all 7 items	The Netherlands	English; Dutch; Norwegian
Korean Internet Addiction Test (KIAT)	Lee et al. (2007)	1: Disturbance of adaptive functions; disturbance of reality testing; addictive automatic thoughts; withdrawal; virtual interpersonal relationships; deviant behavior; tolerance	40	10-15 min	NR	4-point	NR	High-risk; potential risk; normal (cut-off not reported)	South Korea	Korean
Online Game Addiction Scale for Adolescents in Taiwan (OGAST)	Wan and Chou (2006)	1: Compulsive use; Withdrawal; tolerance; conflict	29	10-15 min	12+	4-point	NR	Addicted: $> 3$	Taiwan	Taiwanese
Online Game Addiction Index (OGAI)	Zhou and Li (2009)	1: Control; conflict; injury	12	5-10 min	NR	NR	NR	NR	China	NR
Problem Video-game Playing (PVP) Scale	Salgado and Moira (2002)	1: Preoccupation; tolerance; loss of control; withdrawal; escape; lies & deception; disregard for physical or psychological consequences	9	3-5 min	13+	Yes/No	12 months	Addicted: $\geq 4$ criteria	Spain	English; French; Chinese
Problematic Internet Use Scale (PIUS-30) (adapted)	Serina et al. (2011)	1: Loss of control; problems in social offline relationships; withdrawal symptoms; tolerance; impairments in daily life	20	5-10 min	NR	6-point	NR	Problematic: average ranking larger than 3 according to each item (88th percentile)	Austria	German
Problematic On line Game Use Scale (POGUIS)	Kim and Kim (2010)	1: Euphoria; health problems; conflict; failure of self-control; preference for virtual relationship	20	5-10 min	11+	NR	NR	NR	South Korea	English; Korean
Problematic On line Gaming Questionnaire (POGQ)	Demetrowics et al. (2012)	1: Preoccupation; overuse; immersion; social isolation; interpersonal conflicts; withdrawal	18	5-10 min	NR	5-point	NR	Problematic: $\geq 65$	Hungarian	English
Video Game Addiction Test (VAT)	Van Rooij et al. (2012)	1: Loss of control; intra- and interpersonal conflict; preoccupation; mood modification; withdrawal	14	5-10 min	13+	NR	NR	NR	The Netherlands	English; Dutch
Video Game Dependency Scale (VRN-CVAS-II)	Rehbein et al. (2010)	1: Preoccupation; tolerance; conflict; loss of control; withdrawal; tolerance	14	5-10 min	13+	4-point	NR	Dependent: $\geq 42$	Germany	German
Young Internet Addiction Scale (YIAS)	Young (1998)	1: Tolerance; loss of control; conflict; relapse; lack of desire to change online use	8	5-10 min	NR	Yes/No	NR	Addicted: $\geq 3$ symptoms	United States	English; Chinese; French; Italian; Turkish
Young Internet Addiction Test (YIAT)	Young (1996)	1: Salience, excessive use, neglect - work; anticipation; lack of control; neglect - Social	20	5-10 min	NR	5-point	NR	Normal: 0-35; Problematic: 40-100	United States	Arabic; English; French; Chinese

NR: Not reported

*Problematic online gambling* is often screened with the same tools for offline Pathological Gambling criteria as DSM-IV TR (22), South Oaks Gambling Screen (SOGS) (23) or the Canadian Problem Gambling Index (CPGI) (24) (**Table 3**). A recent systematic review described and discussed the individual, the situational and the structural characteristics of Internet Gambling Addiction justifying the higher rate of its prevalence comparing to land-based pathological use (25).

**Table 3. Assessment tools for pathological online gambling (Kuss and Griffiths 2012) (25)**

Measures	Scores and classification
CPGI (Ferris & Wynne, 2001)	1 - 2 low risk problem gambler
	3 - 7 moderate problem gambler
	> 7 severe problem gambler
DSM-IV-MJ-R (Fisher, 2000)	> 3 problem gambler
DSM-IV TR (American Psychiatric Association, 2000)	3-4 at risk for gambling problem
	> 4 pathological gambler
MGS (Shaffer, LaBrie, Scanlan, & Cummings, 1994)	> 4 pathological gambler
NORC DSM-IV Screen (Gerstein, Murphy, Toce, Hoffman, Palmer, Johnson, Larison, Chuchro, Bard, Engelman, Hill, Buie, Volberg, Harwood, Tucker, Christiansen, Cummings, & Sinclair, 1999)	3 - 4 possible pathological gambler
	> 4 probable pathological gambler
SOGS (Lesieur & Blume, 1987)	1 - 4 some gambling problem
	> 4 probable pathological gambler

#### *Global trend in identifying excessive Internet use*

The great part of the PIU assessment in the literature is conducted regardless to the specific area of Internet overuse. Recent systematic review exists already on tools' structure, prevalence rates and associated factors among adults and adolescents for the last decade, and prevalence disparity in different countries (19).

We aimed in this paper to review the PIU representation trend underlying epidemiological studies in a global perspective since the millennium. A literature search has been achieved through *Pubmed* database using the following search terms (and their derivative): "online" OR "internet" AND "addictive behavior" OR "addiction" OR "pathological" OR "problematic" OR "maladaptive" OR "excessive" OR "overuse" OR "compulsive" AND "epidemiology" OR "prevalence" OR "incidence" OR "national survey" OR "demographic data". Studies searched between May and June 2014 were selected using the following criteria for inclusion: (a) being published since 2000, (b) providing a full-text article, (c) targeting humans, and (d) being an original work. The initial result consisted in 965 papers, that were inspected (title and abstract) for their pertinence, and the papers on specific online activities were excluded. Final data consisted in 88 identified research papers and were organized with regards to the continent where studies were conducted, year of publication, underlying representation to the choice of the assessment tool, targeted sample and resulting PIU prevalence or incidence (**Table 4**). Underlying representation refers to the appellation of the chose assessment tool that is a first indication of how the entity studied is considered (i.e. as an addiction, as an impulse control disorder, as a pathology, as a problem, as a stress factor, as a cognitive disorder, or as a compulsive disorder) by the investigators. We aimed to analyze the cultural representations of the PIU and their evolution through time. In Africa, only one epidemiological study was found (26). It has targeted technology magazine readers, comparing Internet technology workers to the rest of the sample. According to the tool used in this study, the question of PIU is investigated as a problem (26). In America, four epidemiological research were made between 2001 and 2012 mostly in University students (27-30), and the explored PIU being stably considered through time as an addictive disorder. European continent has known a relatively large amount of epidemiological interest between 2004 and 2013 (16 studies) in majority on adolescents recruited in schools, but also through internet applications or phone (31-54). With an initial representation of the PIU as a pathology that persisted through the period (9 studies), and later and in a stable manner through the years but not exclusively, PIU has been considered as an addiction (12 studies). In fact, behavioral, problem, excess or stress factor, are representations of the disorder that emerged sporadically by time. Asian epidemiological studies from

2003 to 2013 targeted mostly child and adolescent in a school based recruitment (55-110) and considered the issue massively (43 from 54 studies) as an addictive disorder and in a lesser extent (6 studies) as a pathological use or as a behavioral (impulse control, compulsion) or a cognitive disorder. We can conclude on differences (i.e. number of scientific publications, representations and targeted samples) between the four continents where published data on PIU prevalence were found since millennium. This could suggest a cultural dimension in the choice of the assessment instrument in PIU research.

Using the screening tools described earlier, several studies also identified some risk factors associated to excessive Internet use ((19) for a review). Psychobiological risk factors include personality and temperament-related factors (e.g., neuroticism, reward dependence, impulsivity and sensation seeking traits). Psychosocial risk factors include poor self-esteem, insecure attachment, and dysfunctional emotion regulation strategies (e.g., rumination, self-blame). A few studies also found that contextual factors, such as negative life events (e.g., trauma, loss of job, familial problems) play a role in the onset and perpetuation of excessive Internet use.

In particular, a growing number of studies emphasized that Internet overuse is strongly associated with poor self-regulation (reflected by poor executive functioning and high impulsivity) (111). On the whole, these studies showed that Internet overuse is associated with high impulsivity traits, impaired executive control (especially regarding the ability to inhibit pre potent or motor responses), and poor decision making in condition of risk and uncertainty. A few studies also found that excessive online gamers are characterized by attentional bias toward salient cues (game-related cues) (112), comparable to what was found in the context of substance-related disorders.

Among the psychological factors involved in excessive Internet usage, the motives that drive the involvement in online activities were shown as key factors (113). Several motives have been related to excessive use of the Internet, including “detachment” or “dissociation” (e.g., loss of boundaries and timelessness) and “socializing” (e.g., meeting people online, socializing in a virtual world). It is worth noting that motives can be really different from one type of online activity to another. Unique motives have been related to online video games (Massively-Multiplayer Online Role-Playing Games, First Person Shooters, Multiplayer Online Battle Arena), including “achievement” (in game advancement and status, competition with peers), “social affiliation” (in game socialization and cooperation, making new relationships), and “immersion” (playing the role of a fictional character, exploring a virtual world, escapism from real life). Interestingly, these motives have been found to predict gaming patterns (114) and have been related to addictive use (113) In particular, problematic gaming was related to the achievement motive and the escapism motive (a sub-dimension of the immersion motive).

**Table 4. Global trend of Internet excessive use identification and representation**

Continent	Year	Study	Underlying representation	Assesment tool	Sample and design (size; gender; age; recruitment)	Estimated prevalence
Africa	2008	Thatcher <i>et al.</i>	Problem	Problematic Internet Use Questionnaire (PIUQ)	n=1399; n1=630 information technology workers ; 84% male, 16% female; n2=769 other workers (non-IT group); 69% male, 31% females; Web site of a South African online information technology magazine	n1: 3.81% high risk, 36.67% moderate risk. n2: 1.91% high risk, 37.39% moderate risk
America	2012	Jelenchick <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=215, 46% male, 54% female, 68%; mean age 18.8 years old; University (target population of regular Internet users, the social networking site Facebook was used to identify potential participants)	12%
America	2011	Christakis <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=224; 46% male, 54% female; 18-20 years old; Facebook search engine to identify profile within selected university networks	4%
America	2011	Liberatore <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=71; 54.9% male, 45.1% female; 13-17 years old; Psychiatric out-patients receiving treatment at the Clinic of the Pediatric University Hospital	7% moderate, 19.7% mild
America	2001	Anderson <i>et al.</i>	Addiction	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM IV) for substance dependence	n=1078; 49.8% male, 50.2% female;	9.8%
Asia	2013	Ahmadi <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=4177; 14-19 years old; School	21.1%
Asia	2013	Ak <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=4311; 46% male, 54% female; 15-19 years old; School	5% excessive, 13% moderate
Asia	2013	Bener <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=2298; 71.6% male, 28.4% female; 12-25 years old; School and University	17.6%



Appendix C

Meeting on Public Health Implications of Behavioural Addictions

Associated with Excessive Use of the Internet, Computers,

Smart Phones and Similar Electronic Devices

Asia	2013	Lai <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=844; 37.7% male, 62.3% female, mean age 15.9 years old; School	3% addicted, 31.6% problematic
Asia	2013	Lee <i>et al.</i>	Addiction	Korean self-reporting Internet addiction scale short form (KS-scale)	n=73238; 52% male, 47.6% female; mean age 15.1 years old; School	3% high risk, 11.9% potential risk
Asia	2013	Li <i>et al.</i>	Pathology	Young's Diagnostic questionnaire (YDQ)	n=2758; 46% males, 54% female; 10–19 years old; School	6.3%
Asia	2013	Liu <i>et al.</i>	Pathology	The Adolescent Pathological Internet Use Scale (APIUS)	n=4559; 48.9% male, 51.5% female, mean age 15 years old; School	10.8%
Asia	2013	Park <i>et al.</i>	Addiction	Internet Addiction Proneness Scale for Youth-Short Form (KS-scale)	n=795; 32% male, 67% female; mean age 13 years old; School	9.4%
Asia	2013	Wu <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=1101; 57.9% male, 42.1% girls; mean age 12.8 years old; School	13.5%
Asia	2013	Yang <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n1=267 Japanese; 33.7% male, 65.9% female; mean age 18.8 years old; n2=236 Chinese; 22.4% male, 65.9% females; mean age 19.4 years old; University	n1: 18.7% n2: 10.2%
Asia	2013	Yu <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=4106; 53.2% male, 45.9% female; mean age 14.65 years old; School	22.5%
Asia	2012	Canan <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=1034; 59.6% male, 40.4% female; age range, 18–27 years old, College and University	9.7%
Asia	2012	Guo <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=3004; 8–17 years old; School	4%
Asia	2012	Mazhari	Problem	Problematic Internet Use Questionnaire (PIUQ)	n=925; 32.9% male, 67.1% female; mean age 21.5 years old; University	21.2%

Appendix C  
Meeting on Public Health Implications of Behavioural Addictions  
Associated with Excessive Use of the Internet, Computers,  
Smart Phones and Similar Electronic Devices

Asia	2012	Moaouad <i>et al.</i>	Impulse control	Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM IV) for the pathological gambling	Medical student sample : n1=140; 49.29% male, 50.71% female; 17-24 years old. Others students sample : n2=140; 45% male, 55% female; 17-24 years old; random sample from a medical university and others universities	n1: 12.14% n2: 18.57%
Asia	2012	Pramanik <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=130; 19-23 years old; University	41.53% moderate, 3.07% severe
Asia	2012	Shek <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=3580; 52.1% male, 47.9% female; mean age 13.64 years old; School	26.7%
Asia/ America	2012	Sun <i>et al.</i>	Compulsion	Compulsive Internet Use Scale (CIUS)	Chinese sample : n1=1761; 49% male, 51% female; mean age 16.8 years old. US sample : n2=1182; 57% male, 43% female; mean age 15.9 years old; School for students who are unable to remain in the regular high school system due to functional reasons	n1: 5.8% female, 15.7% male n2: 9.7% female, 7.3% male
Asia	2011	Cao <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=17599; 51% male, 49% female; 10-24 years old, School	8.1%
Asia	2011	Lin <i>et al.</i>	Addiction	Chen Internet Addiction Scale—Revision (CIAS-R)	n=3616; 50.10% male, 49.9% female; Universities and Colleges	15.3%
Asia	2011	Shin <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=141; 100% male; 73% are graduated from high school, 17% are graduated from university, 10% had completed middle school or less recruited on their workplace in urban areas	9%
Asia	2011	Wang <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=12446 who have ever used Internet; 48.7% male, 51.3% female; 10-23 years old, School	12.2%
Asia	2010	Fu <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	15-19 years old T1 : n=511; 56.1% male and 43.9% female. T2 : n=208; 57.2% male, 42.8% female; household, randomly sampled from the registry of residential addresses	3-4 symptoms 21.6% ; 5 or more symptoms 6.7%

Appendix C

Meeting on Public Health Implications of Behavioural Addictions  
Associated with Excessive Use of the Internet, Computers,  
Smart Phones and Similar Electronic Devices

Asia	2010	Lam <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=1041; 47.2% male, 52.8% female; 13-16 years old; School	6.2% moderate, 0.2% severely at risk
Asia	2010	Xie <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=1560; junior middle school and senior high school	10.2% moderate, 0.6% severe
Asia	2009	Choi <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=2336; 57.5% male, 42.5% female; senior high schools	2.3%- 2.5%
Asia	2009	Kesici <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=384; 40.1% male, 59.9% female; mean age 20.78 years old; undergraduate student	42.18%
Asia	2009	Ko <i>et al.</i>	Addiction	Chen Internet Addiction Scale (CIAS)	n=2293; 51.41% male, 48.59 female; mean age 12.36 years old; School	10.8%
Asia	2009	Ko <i>et al.</i>	Addiction	Chen Internet Addiction Scale (CIAS)	n=9405; 48.3% male, 51.7% female; mean age 14 years old; School	18.7%
Asia	2009	Lam <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=1618; 45.4% male, 54.6 female; 13-18 years old	0.61% severe, 10.2% moderate
Asia	2009	Ni <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=3557; 68.18% male, 31.82% female; 17-24 years old, University	6.4%
Asia	2009	Tsai <i>et al.</i>	Addiction	Chinese Internet Addiction Scale-Revision (CIAS-R)	n=3806; 67.7% male, 32.3% female; University	17.9%
Asia	2009	Yen <i>et al.</i>	Addiction	Chen Internet Addiction Scale (CIAS)	n=2619; 33.5% male, 66.5% female; 18-48 years old	12.9%
Asia	2009	Zhang <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=3507; first and second grade of two middle schools	5.20%
Asia	2008	Cho <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=686; 57% male, 43% female; junior high school	18.22%
Asia	2008	Ghassemzadeh <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=1968; 52% male, 48% female; 14-16 years old; public high schools	1.9% Internet addiction, 15.4% possible Internet addiction

Appendix C  
Meeting on Public Health Implications of Behavioural Addictions  
Associated with Excessive Use of the Internet, Computers,  
Smart Phones and Similar Electronic Devices

Asia	2008	Ko <i>et al.</i>	Addiction	Diagnostic Criteria of Internet Addiction for college (DC-IA-C)	n=216; 61% male, 39% female; 18-27 years old, College	40%
Asia	2008	Park <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=903; 69.6% male, 30.4% female, middle and high school	10.7% Internet addiction, 73.7% possible Internet addiction
Asia	2008	Xu <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=5123; Middle schools	8.78% incidence rate
Asia	2008	Yen <i>et al.</i>	Addiction	Chen Internet Addiction Scale (CIAS)	n=3517; 63% male, 37% female; 11-21 years old, School	20.8%
Asia	2007	Bayraktar <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=686; 50% male, 50% female; 12-17 years old; elementary and high-school	1.10%
Asia	2007	Cao <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=2620; 12-18years old; junior and senior high school	2.4% of all the sample, 1.9% of the sample without psychiatric comorbidities
Asia	2007	Ha <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=452; 57% male, 43% female	1.8% severe, 29% mild
Asia	2007	Ko <i>et al.</i>	Addiction	Chen internet addiction scale (CIAS)	n=517; 52% male, 48% female; 12-16 years old; junior high schools	18%; 7.5% : incidence rate during a 1-year period
Asia	2007	Lee <i>et al.</i>	Addiction	Korean self-reporting Internet addiction scale short form (KS-scale)	n=627; 77% male, 23% female; mean age 15.9 years old; middle and high schools	20.4% potential risk , 4% high-risk
Asia	2007	Yen <i>et al.</i>	Addiction	Chen Internet Addiction Scale (CIAS)	n=1890; 56% male, 44% female; 15-23 years old; senior and vocational high schools	17.9%
Asia	2006	Ha <i>et al.</i>	Addiction	Young's internet addiction scale (YIAS)	n1=455; mean age 11 years old; n2=836 ; mean age 15.8 years old	18% of the sample; 3.8% children; 20.3% adolescents

Appendix C

Meeting on Public Health Implications of Behavioural Addictions  
Associated with Excessive Use of the Internet, Computers,  
Smart Phones and Similar Electronic Devices

Asia	2006	Kim <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=1573; 35.0% male, 65.0% female; 15-16 years old; high school	1.6% Internet addiction ; 37.9% Potential Internet addiction
Asia	2006	Ko <i>et al.</i>	Addiction	Chen Internet Addiction Scale (CIAS)	n=3412; 62.5% male, 37.5% female; junior, senior and vocational high schools	20.7%
Asia	2005	Kim <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=764; junior and high schools	
Asia	2005	Yang <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=328; 50% male, 50% female; 15-19 years old; senior high schools	4.9% excessive, 29.9% moderate
Asia	2004	Chak <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=722; 36% male, 64% female; 12-26 years old; Online questionnaire distributed to the social contacts of the authors, snowballing on the Internet and printed questionnaires distributed to students of secondary schools	14.7%
Asia	2004	Yoo <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=535; 49% male, 51% female; mean age 11 years old; elementary schools	0.9% Internet addiction, 14% propable Internet addiction
Asia	2003	Nalwa <i>et al.</i>	Cognitive distortions	Davis Online Cognition Scale (DOCS)	n=100; age range 16-18 years old	18%
Asia	2003	Tsai <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=700; 16-17 years old; all having experiences of using the Internet; high school	12.8% YQD/ 12.5% IATS
Asia	2003	Whang <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=13588; 58% male, 42% female; mean age 26.7 years old; online survey over one of the most popular portal sites in Korea, called "Daum.net."	3.5% Internet addiction; 21% possible Internet addiction

Appendix C  
Meeting on Public Health Implications of Behavioural Addictions  
Associated with Excessive Use of the Internet, Computers,  
Smart Phones and Similar Electronic Devices

Europe	2013	Lopez-Fernandez <i>et al.</i>	Problem	Problematic Internet Entertainment Use Scale for Adolescents (PIEUSA)	n=1131; 53.5% male, 46.5% female; 12- 18 years old; School	5% problematic, 15.5% at-risk
Europe	2013	Siomos <i>et al.</i>	Pathology/addiction	Young's Diagnostic questionnaire (YDQ)/ Adolescent Computer Addiction Test (ACAT)	n=2684; 48.5% male, 51.5% female; 12-18 years old; School	15.3% YDQ 16.3% ACAT
Europe	2013	Stavropoulos <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)/ Young Diagnostic Questionnaire (YDQ)	n=2090; 49.5% male, 50.2% female; mean age 16 years old; School	3.12% Internet addiction, 10.72% high-risk
Europe	2013	Tavolacci <i>et al.</i>	Stress	Internet Stress Scale (ISS)	n=1876; 51% male, 49% female; 18-25 years old, Higher education during the health forum on campus	26.9% at-risk
Europe	2013	Tozzi <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=1102; 48.7% male, 51.2% female; School	5.63%
Europe	2012	Poli <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=2533; 44.3% male, 55.7% female; 14-21years old, School	0.79% serious, 5.01% moderate
Europe	2012	Claes <i>et al.</i>	Compulsion	Compulsive Internet Use Scale (CIUS)	n=60; 100% female; age range 15-57 years old, mean age 27.82 years old outpatient with eating disorder (ED)	11.7% (life-time prevalence)
Europe	2012	Durkee <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=11956; 43.7 % male, 56.2% female; mean age 14.9 years old; Randomly selected schools, within 11 study sites in Europe: Austria, Estonia, France, Germany, Hungary, Ireland, Israel, Italy, Romania, Slovenia, Spain and Sweden	13.5% maladaptive, 4.4% pathological

Appendix C

Meeting on Public Health Implications of Behavioural Addictions  
Associated with Excessive Use of the Internet, Computers,  
Smart Phones and Similar Electronic Devices

Europe	2012	Fischer <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=1435; 48% male, 52% female; a European school-based intervention study	4.8% pathological, 14.5% risky
Europe	2012	Rusconi <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=250; 14-18 years old	2%
Europe	2012	Siomos <i>et al.</i>	Pathology/ Addiction	Young's Diagnostic questionnaire (YDQ)/ Adolescent Computer Addiction Test (ACAT)	n=2017; 51.8% male, 48.2% female; 12-19 years old, School	15.2%
Europe	2011	Kormas <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=866; 46.7% male, 53.3% female; mean age 14.7 years old; School	1.5% problematic, 19.4% potential, 20.9% maladaptive (problematic and potential)
Europe	2011	Villella <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	High school	1.2%
Europe	2010	Morrison <i>et al.</i>	Addiction	Young's Internet Addiction Test (IAT)	n=1,319; 37% male, 63% female; age range 16-51 years old (mean age 21.24 years old) ; recruitment was via links placed on UK-based social networking sites	1.2%
Europe	2010	Ruiz-Olivares <i>et al.</i>	Addiction	Echeburua's Internet Addiction Test	n=1011; 42.7% male, 57.3% female; age range 18-29 years old ; University	4,5% at-risk, 0.7% Internet Addiction
Europe	2010	Van den Eijnden <i>et al.</i>	Compulsion	Compulsive internet use scale (CIUS)	Study1 : n=4483; 51.3% male, 48.7% female; 10-16 years old; elementary and secondary schools Study2 : n=1647 at T1, n=510 at T2; 32.2% male, 67.8% female; 10-15 years old, MSN instant messenger users	Study 1 : 4.2% . Study 2 : 8% at T1 and 6.5% at T2
Europe	2009	Bakken <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=3393; 47% male, 53% female; 16-64 years old; randomly drawn from the population database	1% Internet addiction, 5.2% at risk
Europe	2009	Tsitsika <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=937; 47% male, 53% female; mean age 15.2 years old; School	1% internet addiction, 12.8% borderline use

Europe	2009	Zboralski <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=120; 55% male, 45% female, 13-18 years old; School	5.8% Internet addiction, 19.2% at risk
Europe	2008	Mythily <i>et al.</i>	Excessive	Excessive use is internet use for more than 5 hours/day	n=2735; 49.3% male, 50.6% female; 12-18 years old; Secondary schools	17.1%
Europe	2008	Pallanti <i>et al.</i>	Addiction	Young's Internet Addiction Scale (YIAS)	n=275; 52.4% male, 47.6% female; mean age 16.67 years old; high schools	5.4% Internet addiction, 28.7% possible Internet addiction
Europe	2008	Siomos <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=2200; 49% male, 51% female; 12-18 years old, School	5.9% Internet addiction
Europe	2005	Niemz <i>et al.</i>	Pathology	Pathological Internet Use Scale (PIUS)	n=371; 46% male, 54% female; mean age 21.5 years old; E-mail sent to class lists from the Nottingham Trent University	18.3% Problematic; 51.2% LS
Europe	2004	Johansson <i>et al.</i>	Pathology	Young Diagnostic Questionnaire (YDQ)	n=3237; 51% male, 49% female; 12-18 years old; One group of subjects were interviewed by phone (n1= 1913) and another group completed a postal survey questionnaire (n2= 1324).	1.98% Internet addiction, 8.68% at-risk

#### Identification's limitations and perspectives

In addition to the critical psychometric properties of several instruments used to assess Internet excessive use; their disparity, the major focus in youth rather than adult samples and the miscellaneous theoretical construct underlying their development; lead to heterogeneous conclusions. Results cannot be neither generalized nor cross-comparable nor efficiently support public health prevention actions or give the clinician clarity on what is about and the criteria to treat or not. This represents a deplorable statement when considering the efforts made by scientific community (i.e. high rate of publications in the field, study designs and funding) and Internet users' willingness to participate in such studies. Perspectives for future research could be to study elderly PIU. In fact at time, there is no data on this population as reported and discussed in a recent critical review (115), despite the neurological, social, somatic and psychiatric vulnerability proper to this age and consisting a risk-factor for PIU.

#### Treatment

There is no actual consensus on how to treat subjects suffering from PIU and seeking treatment. Nevertheless, clinicians are treating patients presenting Internet addiction according to their knowledge on psychotherapy (mainly Cognitive and Behavioural therapy) and pharmacotherapy.

Recent papers reviewed published studies on efficacy of such approaches (116-118). We present in **Table 5** a summary of published psychosocial interventions studies.

Winkler *et al.* (118) have conducted the most recent meta-analysis on "Internet addiction" (IA). Their review included 16 studies, three of which employed a drug-based intervention, published as of April 2011. They reported that treatment effect size estimates indicated that psychological and pharmacological interventions were "highly effective" for reducing IA symptoms, time spent using the Internet, and comorbid depression and anxiety. They concluded that these effect sizes were "high, robust, unrelated to study quality or design, and maintained over follow-up". However, a significant



caveat of their review was that only 4 of the 16 reviewed studies had actually conducted a follow-up assessment of treatment outcome.

Additionally, most of the reviewed studies lacked adherence to the CONSORT statement, thereby raising concerns about the adequacy of the studies for meta-analysis. Winkler et al., acknowledged these limitations, and commented that their analysis should be regarded only as preliminary (118).

King, D. L. and P. H. Delfabbro (116) reviewed treatment studies on a specific type of PIU, Internet gaming disorder (IGD). The results of this review suggest several methodological improvements to future treatment studies of IGD. There remains a need for clinical research studies to employ control groups, as well as more precise estimates of treatment effects by including estimates of effect size and confidence intervals. This review suggests that current data on IGD treatment may be too preliminary to support widespread dissemination of treatment techniques employed in clinical studies. It is suggested that future studies would be improved by: (a) the inclusion of a detailed follow-up assessment of 3 to 6 months and optimally 12 months; (b) an assessment of rates of recovery and relapse; (c) examination of formative change in diagnosis from baseline to follow-up; (d) broader assessment of treatment outcomes, including quality of life measures as well as measures of cognitive change in studies employing Cognitive and Behavioral Therapy (CBT); (e) an investigation of participants' longer term psychosocial adjustment to sudden decreases in Internet gaming; and (f) increased adherence to the CONSORT statement. There is also a need for more clinical studies employing adult samples, given that the average age of Internet gamers exceeds 30 years in industrialized Western countries. Adults may be more likely to seek and engage in treatment and report greater motivation to change than adolescents (119). On this basis, although limited research evidence suggests that certain interventions may have some benefit for individuals with IGD, there remains a need to properly qualify such benefits within a critical examination of how clinical status and treatment outcomes in IGD studies are determined, as noted in a recent commentary by King and Delfabbro (116).

**Table 5. Psychosocial treatments for Internet addiction: open label studies and controlled trials (Ahab et al. 2014) (120)**

Publication	Assessment	Method	Population	Treatment	Outcome	Effect size
Bai et Fan (2007) China	Chinese addiction scale - revised	Open label study N =48	College students Age: m=19 16.7 % women	Multi level counseling model:  CBT, social competence training, self-control strategies, communication skills (in group)	Reduction of internet addiction symptoms	IA: 1.45
Cao et al (2007) China	YDQ/Chinese addiction scale revised / screening for childhood related anxiety disorders.	Open label study N =57	2620 students from four middle schools of Changsha City were surveyed using YDQ  Following clinical interview students who met IA criteria were recruited	CBT	-Reduction of emotional symptoms  -Reduction of addiction symptoms	IA: 1.09  Anxiety: 0.78
Du et al. (2010) China	Beard's Diagnostic Questionnaire	Randomized controlled trial N = 56	School students  Age: m= 12-17  Met diagnostic criteria according to Beard's diagnostic questionnaire	Multilevel  School based intervention involving 8 sessions of group based CBT	- reduction of internet use and anxiety  -improvement in time management  -treatment gains observed at six months follow up	Post treatment IA : Cohen's d= 1.08  Follow up (6 months) IA: Cohen's d = 1.35

Appendix C

Meeting on Public Health Implications of Behavioural Addictions Associated with Excessive Use of the Internet, Computers, Smart Phones and Similar Electronic Devices

Kim (2008) Korea	Korean-Internet addiction	Controlled trial N = 25	University students  Volunteers from a sample of 32 internet addicts who were screened	Group counseling  Reality therapy (5 weeks)	-reduction of internet addiction symptoms  -increase in self-esteem	Not reported
Lanjun (2009) China	Internet addiction scale State-trait anxiety inventory for adults.	Open label study N = 70	College students 45.71 % women	Multi level counseling model: CBT + sport	-reduction of anxiety  -reduction of addiction symptoms	IA: 2.98  Anxiety: 0.43
Li and Dai (2009) China	Chinese internet addiction scale	Controlled trial N = 76	Adolescents 10.53 % women	CBT (individual)	. reduction of addiction symptoms  -reduction of anxiety, depression and compulsions	IA: 1.46
Orzack et al (2006) US	Orzack Time intensity Scale (OTIS)  Beck Depression inventory	Open label study N = 32	Men Age: m = 26-59  Involved in internet-related problematic sexual behavior	Multi level counseling model:  CBT, readiness to change, motivational interviewing	-better quality of life  -reduction in depressive symptoms  . patients with co-morbid anxiety/mood disorders responded best to treatment	Time: .27  Depression: .35
Su et al. (2007) China	Young diagnostic questionnaire (YDQ)	Controlled trial N = 65	University students recruited from a university in Beijing  Voluntary screening with YDQ (N=91) - participants: classified as "dependant" or "at risk" according to YDQ, or being online for more than 14 hours per week	Self-help (3 types)	For all groups  -reduction of addiction symptoms  - reduction in hours spent online	YDQ: Cohen's d = 0.72-0.82  Online activity Cohen's d = 0.75-0.98

Wartberg et al (2014) Germany	Compulsive Internet Use Scale (CIUS)	Pilot study	Adolescent < 17 years old  N = 18	Group CBT  (15 month follow up)	lower severity of problematic internet use  Reduced average usage times during the week and weekend  No changes in psychological well-being.	NA
Young (2007) US	YDQ  Hamilton depression scale	Open label study  N= 114	Clients seen through the "Center for Online addiction" screened using the IAT  42 % women  Age:  m = 38 for men  m = 46 for women	CBT ( 12 sessions)	-reduction of clients' thoughts and behaviors related to compulsive Internet use  -Gain observed at 6 months follow up	IA: .93  Time: 2.38

The published studies on non specific approaches are based upon current techniques of addiction treatment. These include self-support programs adapted from the 12 steps model, rehabilitation programs in residential setting, motivational approach, cognitive-behavioral techniques to identify and treat cognitive distortions, and psycho education for coping to emotions (121, 122). There has also been an emergence of Internet-based therapeutic programs (123) that can be suitable for intensive electronic media users seeking treatment (124).

No medication has received at time accreditation for the treatment of behavioral addictions. This could be multi-factorial (e.g. costs for new medication development, not sufficient evidence on a yet non-recognized disorder, treatment target being mainly children and adolescents) (125). In clinical practice, the indication of pharmacotherapy is then based on the presence of possible co morbid disorders such as symptoms anxiety or mood disorders (11, 125). Some research also tried to test existing medications for addictive disorders, obsessive compulsive disorders without convincing results (125).

Many specialized treatment programs exist mainly in Asian countries but also in Europe and English-speaking countries. They are often developed in association with gambling addiction treatment programs (120). Geneva specialized treatment program in behavioral addictions exists since 2007 and a retrospective study on patients seeking treatment for cyber addiction during 3 years-period (2007-2010) has been recently published (126). Of the 57 participants, 98% were male and 37% were 18 years or younger. Most patients were online video-gamers. Their mean level of Internet engagement was moderate (IAT score was 52.9 (range 20–90)). Sixty-eight percent of patients had a co-morbid psychiatric diagnosis, with social phobia being the most prevalent (17.8%). The dropout rate from treatment concerned 24% of patients seeking treatment. Those who remained in treatment showed an overall significant or average (38.6%) improvement of their initial symptoms according to the Clinical Global Improvement (CGI), whereas 26.3% showed minimal CGI score improvement, and 14% showed no change (126).

### **Conclusion**

Internet is a highly useful and the vector of a huge entertainment and information amount and diversity. The attractiveness and accessibility of this media could be a risk factor for some vulnerable subjects to engage in problematic use for them and for their daily life. This consists in a complex and multifaceted disorder that needs more uniformity in the way it is investigated but more predispositions to identify and treat its diverse forms and patients' profiles. Cultural particularities and specific environmental technology level are two parameters that should receive scientific interest clarifying their interaction with other psychosocial factors and taking into account their role in society norms of Internet use.

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### **Internet-related Health Problems (Prepared by Department of Health, Hong Kong)**

1. In view of the rapid development of Internet and electronic screen products including computers, video games, e-books and magazines, televisions, smartphones and other electronic entertainment and communication screen products, and the related health concerns on children and adolescents, the Department of Health of Hong Kong convened the Advisory Group on Health Effects of Use of Internet and Electronic Screen Products (Advisory Group) in December 2013 with the following Terms of Reference:

- To discuss and comment on harmful health effects arising from use of Internet and electronic screen products (with or without Internet connection) for children and adolescents.
- To work out a set of recommendations on healthy use of Internet and electronic screen products for children and adolescents, parents and teachers.

2. The Advisory Group noted that more concerns were relating to the use of newer types of electronic screen products which were becoming more popular. However, the Group noted that there were also concerns about the very young watching television and video for learning or recreational purposes. Some electronic screen products like video game or e-book may also have potential harms if they are used improperly. Moreover, spending too much time in front of the screen i.e. prolonged screen time is also a health concern. The Advisory Group agreed that electronic screen products with a wider coverage, but not just computer and the newer digital products, be discussed.

3. The Advisory Group noted that there were benefits and positive health effects relating to the use of electronic screen products e.g. convenient access to useful health information, facilitate daily activities of the disabled, etc. However, the Advisory Group agreed to focus on the adverse health effects so as to raise awareness of the target population about its potential health risks and take appropriate precautionary measures.

4. Extensive search of information including published literatures and reports from various authorities was conducted. While the primary focus of information was put on adverse health effects, those health issues that might be positively or negatively affected by using Internet and electronic screen products e.g. cognitive development, information on both sides was included for a more balanced view.

5. Since there had not been a lack of reviews conducted by various authorities or institutions, including some from reputable organizations, the Advisory Group studied and discussed this analysed information, where available, instead of going through the process of examining extensive amount of original studies.

6. The Advisory Group made reference to the health concerns raised by the general community as reported in mass media, and through surveys and contacts with the target groups, i.e. children, adolescents, parents and teachers during various routine and ad hoc services and activities. The Advisory Group also made reference to the studies in overseas authorities in determining the topics of health concerns. Information on 14 health concerns was identified, grouped under physical health and psychosocial health. The list is not meant to be comprehensive or exhaustive but these are the areas with more concerns in the current context.

#### Physical Health

- i. Physical fitness and obesity
- ii. Vision
- iii. Musculoskeletal problems
- iv. Hearing
- v. Injury and accident
- vi. Infection
- vii. Health concerns relating to radiofrequency electromagnetic field

#### Psychosocial Health

- i. Addiction
- ii. Cyber-bullying
- iii. Cognitive development and learning
- iv. Social development
- v. Sleep deprivation
- vi. Online sexual risky behaviour
- vii. Aggressive behavior

7. The position statements of the Advisory Group about these 14 health concerns are appended in the Annex. The full report together with executive summary, which was released to the public on 8 July 2014, is available at <http://www.studenthealth.gov.hk/english/internet/report/report.html>

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**Position Statements of the Advisory Group on  
Health Concerns relating to Use of Internet and Electronic Screen Products**

**Physical Health**

*1. Physical fitness and obesity*

The Advisory Group agrees that there is strong evidence to support proportional relationship between obesity and screen time. As this is more relating to sedentary lifestyle and other associated behaviours during these activities like snacking and decreased sleep time, recommendations should be focused on the encouragement and facilitation of physical activities and other healthy lifestyles.

*2. Vision*

The Advisory Group agrees that prolonged use of electronic screen products will lead to eye and visual symptoms like ocular discomfort, eyestrain, dry eye, headache, blurred vision and even double vision. It is advisable to adopt measures like regular breaks with eye blinking, make reference to international occupational safety guidelines in computer set-up, choose to view with bigger text size and use stands for tablet personal computers and smartphones, and to maintain an appropriate visual distance with the screen. At present, there is limited evidence to conclude the long term adverse effects on eye and vision problems in relation to use of electronic screen products, but related studies should be observed continuously and overuse of these products is not recommended.

*3. Musculoskeletal problems*

The Advisory Group agrees that prolonged use of electronic screen products in a fixed posture can cause or exacerbate musculoskeletal symptoms. It is advisable to adopt ergonomic measures and regular breaks with relaxation exercise to avoid over stressing the muscles. There is limited evidence at the moment to conclude long term adverse effects on the musculoskeletal health relating to use of electronic screen products, but related studies should be observed continuously and overuse of these products is not recommended.

*4. Hearing*

The Advisory Group agrees that mobile electronic screen products with audio entertainment function could generate sound at harmful levels. Prolonged exposure to excessive sound levels generated by these products would result in permanent hearing damage. Healthy listening habits should be established at young age.

*5. Injury and accident*

The Advisory Group considers use of mobile electronic screen products while doing other tasks may relate to injury and accident. Public awareness and promotion on safe use of mobile electronic screen products to prevent injury and accident is recommended.

*6. Infection*

The Advisory Group considers that there is potential risk to spread pathogens through the use of smartphones and other mobile electronic screen products. Awareness should be raised to the users to adopt hygiene precautions like hand washing and avoidance of sharing of such products between different users, especially with individuals who have symptoms and signs suggestive of active infections.

*7. Health concerns relating to radiofrequency electromagnetic field*

The Advisory Group notes that there is no conclusive evidence at this stage to show that radiofrequency signals from wireless networks or mobile phones cause cancer in human beings. It is recommended to keep in view the latest scientific information for the health effects of wireless networks or mobile phone use in children.

**Psychosocial Health**

*1. Addiction*

The Advisory Group agrees that the increasing time spent by children on Internet and electronic screen products is a concern. While it is noted that more research and evidence are needed on Internet addiction, the Advisory Group considers that it is more important to prevent children from spending excessive amount of time on Internet and electronic screen products that would affect their other more important tasks or daily routine. Measures that help to increase the protective factors and reduce the risk factors of Internet addiction, which are also consistent with principles of positive parenting, should be promoted.

*2. Cyber-bullying*

The Advisory Group agrees that the characteristics of the current Information and Communications Technology make cyber-bullying happen more easily and has a more damaging effect. The association of the serious psychosocial consequences among victims of cyber-bullying is a concern. Early prevention programme involving the schools are recommended to be continued and further strengthened.

**3. Cognitive development and learning**

The Advisory Group agrees that there is currently no conclusion on the effects of learning with electronic screen products including video games in different age groups or use of media in young children under two years of age. The Advisory Group considers that use of Internet and electronic screen products may have other adverse effects on health and development, especially for children under two and children using these products without proper guidance or supervision. To help children have a healthy whole person development and enjoy the benefits brought by the new technology, the Advisory Group recommends parents to provide appropriate guidance and supervision. Parents should discourage children under two years of age to use Internet and electronic screen products.

**4. Social development**

The Advisory Group notes the concern that spending too much time on Internet and electronic screen products may hinder the social skill development of children. While more research and evidence are needed on this aspect, the Advisory Group considers that it is more important for parents to facilitate the age appropriate social skill development of children e.g. cultivate more quality time and family activities involving face to face interaction, encourage and facilitate more participation in cooperative group activities.

**5. Sleep deprivation**

The Advisory Group agrees that excessive use of smartphones and electronic screen products relates to sleep deprivation which affects growth and development in children and adolescents. Sleeping guide should be advised including establishment of a bedtime routine, suggested sleeping time for different age groups, parenting skills and setting up of stimulation-free and comfortable sleeping environment.

**6. Online sexual risky behaviour**

The Advisory Group considers the increasing popularity of Internet use may render adolescents easier to engage in online sexual risky behaviour, especially the vulnerable ones with psychosocial risk factors. Such behaviour may be associated with other adverse psychosocial or mental health problems. Parents, teachers and professionals working with adolescents should be aware of such behaviour in adolescents. Awareness and education programme to address this issue are recommended to be further strengthened.

**7. Aggressive behaviour**

The Advisory Group considers that violent content of the video and online games would have adverse effects on the behaviour of children. Parents should choose appropriate video games for their children and give them relevant guidance. Information and measures to help parents and children choose such games e.g. censorship, rating system, parents' guides would be helpful.

### **An Overview of Prevention and Intervention Work on Health Problems Relating to Use of Internet in Hong Kong (Summary)**

Various government departments, public agencies, and non-government organisations in Hong Kong have been providing different programmes and services, including prevention and intervention, to address the issues relating to adverse health effects arising from use of internet and related electronic products.

2. Programmes and services include health promotion on physical activities and restriction of screen time; territory wide campaigns and school programmes on awareness of safe and proper use of internet and promotion of cyber-safety; education and prevention of internet addiction, cyberbullying and gambling; counselling and intervention for those with internet addictions and problematic use of internet, etc.

3. Relevant education materials, guidelines, recommendations and information on activities are available in websites of various organizations. Talks, seminars, workshops and trainings for different target groups are being organized by different agencies.

4. Some organisations, mainly the non-government organisations (NGOs) are providing counselling and intervention services to help those addicted to the use of internet through various means e.g. telephone hotline, Whatsapp, chat room, individual or family counselling, group interview and support network. Some of the services are incorporated into other related services e.g. treatment for different kinds of addictions, instead of specific intervention for internet addiction.

5. At the moment, most of the counselling and intervention services for internet addiction in Hong Kong are provided by NGOs, mainly handled by social workers. The public medical sector rarely encounters



these cases.

6. In view of rapid development and penetration of the technology as well as increasing use of internet and related products by general public, there is a need to keep a close monitoring on the public health impacts of conditions associated with excessive use of the technology and products with a view to fine tuning the services.

## **An Overview of Prevention and Intervention Work on Health Problems Relating to Use of Internet in Hong Kong**

### **Introduction**

1. Since the invention of computer and internet decades ago, related health problems associated with its use have been reported and studied all over the world. With the increasing popularity of the affordable internet access via different handheld products like smartphone and tablet, it is anticipated that more and more people may be affected by the excessive use of Internet and related electronic screen products. While these new technologies have brought a lot of convenience to us and already become integral to our daily lives, there are potential risks to the health of the users, in particular those with excessive use.

2. Although internet addiction is not yet classified as a disease, the excessive use of internet is worrying. More and more children are using internet and electronic screen products, the age of using these products is getting younger and the amount of time spent is increasing. According to the Thematic Household Surveys by Census and Statistics Department of Hong Kong, proportion of children aged 10 - 14 who had spent 20 to 50 hours per week in using internet increased from 16.3% in 2003 to 37.2% in 2012; the figures for those aged 15-24 also increased from 32.3% in 2003 to 61% in 2012. According to the survey conducted by the Department of Health in 2014, the median age of pre-school children in Hong Kong started using computer was 24 months old and that for tablet personal computer was 16 months old.

3. In Hong Kong, different sectors and disciplines in the community including government bureaux and departments, schools, non-government organisations (NGOs) are providing different programmes to different target groups with the aims to prevent various adverse consequences including internet addiction, and to help those suspected to have problematic use.

4. The following is a brief account on the work of some of the government bureaux and departments, public agencies and NGOs on prevention and intervention of health problems relating to internet use. The list of organisations and information is not exhaustive.

### **Government Bureaux and Departments**

#### Department of Health (DH)

5. One of the major roles of the DH is disease prevention and health promotion through partnership.

6. In view of the increasing use of internet and concerns about health risks associated with its use on children and adolescents, DH convened the Advisory Group on Health Effects on Use of Internet and Electronic Screen Products in December 2013 and invited medical specialists as well as other professionals to address the issue. The Advisory Group published a report with recommendations in July 2014. Various service units within DH are actively promulgating the information in their routine services as well as through their health promotion partners, including other government departments, schools, NGOs, and other related organisations. DH is also encouraging its partners to incorporate the recommendations into their services and programmes where appropriate.

7. DH has been working on this important topic through various channels e.g. incorporating relevant information in its health promotion activities. Guidelines on physical activities to different target groups including children and parents on restriction of screen time for children are available in major health promotion programmes including "Change for Health" ([www.change4health.gov.hk](http://www.change4health.gov.hk)) and "Start Smart Parent Guide" (<http://www.startsmart.gov.hk>).

8. Health education materials relating to use of computer, internet, screen time and internet addiction are also promulgated through various service units e.g. Smart e-Team for primary school and secondary school students, parents and teachers produced by the Student Health Service ([http://www.studenthealth.gov.hk/english/internet/health\\_effects.html](http://www.studenthealth.gov.hk/english/internet/health_effects.html)), health promotion article "Trapped in the Net" by the Non-communicable Disease Division ([http://www.chp.gov.hk/files/pdf/ncd\\_watch\\_jul2013.pdf](http://www.chp.gov.hk/files/pdf/ncd_watch_jul2013.pdf)) and Newsletter for professionals and parents "Children's Screen-media Use" by the Family Health Service ([http://www.fhs.gov.hk/english/health\\_professional/OMP\\_eNewsletter/index.html](http://www.fhs.gov.hk/english/health_professional/OMP_eNewsletter/index.html)).

9. In addition, out-reach programmes by the Student Health Service including talks to students and parents on healthy use of internet including "Balance in Net" for Secondary 1 to 6 students, and "Never Lost in Net Again" for parents are regularly conducted.

#### Education Bureau (EDB)

10. With the rapid development of Information and Communications Technology (ICT), e-learning is one of the major directions for education and learning. Instead of avoiding or discouraging the use of ICT, it is more important to be aware of the potential health risks relating its use, especially the improper use, and adopt appropriate measures to minimize the risks. A significant amount of time that children spent on internet and electronic screen products relates to search of information and preparation of home work for academic purposes.

11. EDB and schools in Hong Kong have taken note of the potential adverse harmful health effects and have on-going development of school curriculum and learning / teaching resources at different key learning stages, implemented cyberbullying awareness programmes in schools as part of the anti-bullying campaign, and provided training to teachers on various themes like cyber-safety and sex on the media. Advice on the use of computer and e-books in respect to vision health has been provided.

12. Starting from the Third Strategy on Information Technology in Education (2007/08), EDB has allocated funding to promote parents' information literacy and assist them in guiding children to use information technology at home. This included providing resources to promote internet safety (<http://internetsafety.edb.hkedcity.net>) which addressed issues on internet addiction, cyberbullying and copyright.

13. EDB has commissioned to NGOs to conduct seminars for students, parents and teachers. To address individual concerns, EDB has also commissioned to NGOs to provide a hotline service by social workers to receive and address the needs of students, parents and teachers.

14. In the proposed Fourth Strategy on Information Technology in Education, EDB plans to further communicate with stakeholders and address their concerns on e-safety, copyright, healthy use of mobile computing devices and cyber-bullying. ([http://www.edb.gov.hk/attachment/en/edu-system/primary-secondary/applicable-to-primary-secondary/it-in-edu/it-in-edu/Policies/4th\\_consultation\\_eng.pdf](http://www.edb.gov.hk/attachment/en/edu-system/primary-secondary/applicable-to-primary-secondary/it-in-edu/it-in-edu/Policies/4th_consultation_eng.pdf))

15. Relevant guidelines and resource packages have been produced by EDB, e.g. Resource Package on Anti-Bullying in School 2004 and 2010, Internet Safety Information Channel which contains teaching kits, eye care information, guidelines for students and parents (<http://internetsafety.edb.hkedcity.net/>), Healthy Use of the Internet-Educational Kit for Secondary Schools (2013) (<http://healthynet.proj.hkedcity.net/en/index.php>) aiming to help students to identify healthy information in the web and to stay away from materials that contain obscene, indecent or violent contents.

#### Home Affairs Bureau (HAB)

16. One of the main concerns on internet addiction is online gambling. In Hong Kong, HAB is the responsible government agency for formulating gambling policy and monitoring its implementation. ([http://www.hab.gov.hk/en/policy\\_responsibilities/District\\_Community\\_and\\_Public\\_Relations/gambling.htm#5](http://www.hab.gov.hk/en/policy_responsibilities/District_Community_and_Public_Relations/gambling.htm#5))

17. The gambling policy is to restrict gambling opportunities to a limited number of authorized and regulated outlets. At present, such authorized gambling outlets include horse racing organized by the Hong Kong Jockey Club, the Mark Six Lottery, authorized football betting and gaming activities authorized by the public officer appointed by the Secretary for Home Affairs under the Gambling Ordinance.

18. HAB is implementing various preventive and remedial measures in addressing gambling-related problems. The major activities include research and studies on gambling-related issues and problems, as well as public education and other measures to prevent or alleviate problems relating to gambling.

19. Since 2003, HAB has commissioned various NGOs to launch education programmes which target the young people, school students, teachers, parents and district personnels on gambling-related problems. The theme of these programmes was commonly known as "Say No to Gambling", with the primary objective of enhancing understanding of the causes and problems of gambling on the one hand, and strengthening individuals' (particularly young people's) ability to exercise self-control against the temptation of gambling on the other hand.

20. To effectively spread the message of "Say No to Gambling" to all levels of the community, HAB has produced various television and radio announcements of public interests (APIs). By showing the audience the adverse impact that could be caused by gambling on one's health, family, social status and finance, the slogans in the APIs : "Don't Gamble your Life Away", and "Don't Gamble to Excess" have become widely known to the community.

21. In 2004 and 2006, a docu-drama was produced to disseminate the message of "Say No to Gambling". A series of 16 episodes building on real-life experiences were broadcast to promulgate the psychological and financial damages that could be caused by problem and pathological gambling to the gamblers from different walks of life.

22. Over the years, education campaigns by HAB as mentioned above have repeatedly emphasized on the adverse impact of excessive or illegal gambling on the community, especially on the young people. It is stipulated in the law that it's illegal for gambling operators to accept bets or allow the participation in gambling activities by young people below the age of 18.

23. HAB also cooperates with relevant government departments, including the Education Bureau, the Police and the Social Welfare Department and the NGOs, particularly the youth organizations, in launching education campaigns to remind the young people not to engage in underage or illegal gambling.

#### Office for Film, Newspaper and Article Administration (OFNAA)

24. OFNAA acts as a regulatory agency on film, newspaper and article publications in accordance with the relevant legislation. It provides service for film censorship, publication monitoring and local newspaper registration; promotes public awareness and understanding of the control of obscene and indecent articles; provides publicity and public education activities on the Control of Obscene and Indecent Articles Ordinance (COIAO) as well as implements a Code of Practice with the Hong Kong Internet Service Providers (ISP) Association.

25. Currently, the publication of obscene and indecent articles on the internet via Hong Kong-based servers is regulated under the COIAO. Such articles are dealt with under a co-regulatory approach, whereby the OFNAA implements a Code of Practice with the Hong Kong ISP Association. Under the Code of Practice, if the content under complaint is indecent, the ISP concerned will request the webmaster to add the required statutory warning notice or remove the indecent article. If the content under complaint is likely to be obscene, the ISP concerned will block access to the article or request the webmaster to remove it. The ISPs may also cancel the account of the repeated offenders. OFNAA or ISPs will refer cases involving obscene articles to the Police for follow-up enforcement action.

26. One of the main areas of concern on problematic use of internet is addiction to online gaming, such games may have inappropriate content for children and adolescents. All computer and video games published in Hong Kong are under the regulation of the COIAO, and, depending on whether their content is obscene, indecent or neither, are subject to different restrictions of publication.

27. OFNAA organizes publicity and educational programmes on the operation of the COIAO, mainly targeting children and teenagers, as well as workshops to brief parents on the use of the internet and the availability of different types of filtering solutions, and distributes filtering software free of charge to parents.

#### Office of the Government Chief Information Officer (OGCIO)

28. Hong Kong has been promoting ICT which is a key enabler underpinning Hong Kong's thriving

economy. The government has set up the OGCIO which provides a single focal point with responsibility for ICT policies, strategies, programmes and measures under the Digital 21 Strategy ([www.digital21.gov.hk](http://www.digital21.gov.hk)), in addition to providing information technology services and support within the Government.

29. The Digital 21 Strategy sets out five action areas:

- Facilitating a digital economy
- Promoting innovation and technology
- Developing Hong Kong as a hub for technology and trade
- Development of the next generation of e-government services
- Fostering a digital inclusive society

30. While OGCIO is responsible for promoting ICT, it is also concerned about the possible adverse impact on the users. As such, OGCIO commissioned a one-year territory wide “Be NetWise” internet education campaign from September 2009 to November 2010, with a budget of HK\$ 63 million, to promote the safe and healthy use of the internet among students, their parents and teachers.

31. Moreover, a designated webpage on internet safety is launched and maintained by OGCIO ([www.infosec.gov.hk](http://www.infosec.gov.hk)). Various guidelines and information on safe use of internet including cyber-safety, prevention of cyber-crime, etc. are also available for general public, students, youngsters, parents, teachers, IT professionals.

32. Promotion campaign and various events are organized aiming to educate the public to raise their awareness and protection on IT security e.g. “Build a Secure Cyberspace 2014-Information Security Starts from Me” which includes school visits, seminars and talks, radio programmes, contest.

#### Social Welfare Department (SWD)

33. Among other tasks, SWD has commissioned three NGOs, namely, The Boys' and Girls' Clubs Association of Hong Kong (<http://nitecat.bgca.org.hk/index.php#>), Caritas – Hong Kong (<http://it.caritas.org.hk/>) and The Hong Kong Federation of Youth Groups (<http://utouch.u21.hk/>) to each implement a pilot cyber youth outreaching project for three years commencing from August 2011 to July 2014. With further funding support from the Lotteries Fund, the three pilot projects are extended for one more year until July 2015.

34. The pilot projects aim at using cyber means to identify and serve needy youths, in particular at-risk/hidden youths. The social workers would identify them through their common ways of communication in internet such as emails, MSN, chat rooms, online games. The engaged at-risk/hidden youths will be provided with counselling and support service. Referrals to other service units will be made as appropriate if follow up is required.

#### **Non-government Organisations**

##### The Hong Kong Federation of Youth Groups (HKFYG)

35. Under the support of the Office of the Government Chief Information Officer, HKFYG acted as the central coordinator of a territory-wide “Be Netwise Internet Education Campaign” in 2009-10. Engaging 13 other NGOs and other organisations, the campaign aimed to foster a healthy internet culture among children and youth. Targeted at students of primary and junior secondary levels as well as their parents and teachers, “Be Netwise” aimed to enhance their awareness of safe and proper internet behaviours through a wide array of activities at territory-wide and district-based levels.

36. Activities included massive educational programmes, such as talks for students, parents and teachers, production of parents handbooks and educational kits, home visits, awareness activities and setting up of cyber safety portal and supportive hotline service.

37. As part of the campaign, the “NetWise Support Centre for Families” was set up to provide multi-disciplinary support to youth and parents on issues associated with internet use. Services offered include hotline support, education, counseling, therapeutic treatment and parent-child mediation. The service of the Centre was extended for 9 months till summer 2011.

38. In relation to this programme, three surveys were conducted, two on views of parents and young people about risks on the internet, and one on cyberbullying among secondary school students.

39. Although the campaign officially ended in 2010, the web-site with relevant information is still accessible at the link <http://be-netwise.hk/>

40. Final report on “Be Netwise” Internet Education Campaign is available at [http://benetwise.hk/download/Be-Netwise\\_Report.pdf](http://benetwise.hk/download/Be-Netwise_Report.pdf) and the survey reports are available at the following:

- Risks on the Internet: Views on parents and young people (Youth Poll Series no. 189, 190) : [http://benetwise.hk/download/poll\\_189&190.pdf](http://benetwise.hk/download/poll_189&190.pdf)
- Risks on the Internet: Views on parents and young people (Youth Poll Series no. 201, 202): [http://benetwise.hk/download/poll\\_201&202.pdf](http://benetwise.hk/download/poll_201&202.pdf)
- A Study on Cyber-bullying among HK Secondary School Students (Youth Study Series): [http://benetwise.hk/download/cyberbully\\_research.pdf](http://benetwise.hk/download/cyberbully_research.pdf)

41. To extend the work on addictive problems, HKFYG had sought another funding source to launch a Youth Wellness Centre (<http://ywc.hkfyg.org.hk>), a counselling centre in dealing with 5 addictive behaviors including drug, alcohol, smoking, gambling and internet addiction. Majority of cases referred were internet-related problems. Social workers conducted home visits and worked with the whole family, while the clinical psychologist would offer psychological assessment and psychotherapy to individual clients when necessary.

42. In addition to the above mentioned services, HKFYG also operates a telephone hotline “Youthline” which has been in operation since 1993, and launched a WhatsApp service in 2013, to handle mental health, emotion and school problems. Relevant information is available at the following links:

- [https://m21.hk/partnership/issue269\\_nov2013/news\\_long.html](https://m21.hk/partnership/issue269_nov2013/news_long.html)
- <http://mcc.hkfyg.org.hk/page.aspx?corpname=mcc&i=6445>
- <http://mcc.hkfyg.org.hk/page.aspx?corpname=mcc&i=6379>

#### Tung Wah Group of Hospitals (TWGH)

43. TWGH runs a “Say No to Cyber Addiction Project”. The project aims to enhance public awareness, especially adolescents, parents and teachers, on internet addiction; and promote healthy family life with balanced lifestyle in order to prevent internet addiction. The project targets at primary and secondary students, adolescents who are at risk of internet addiction, youth workers, teachers, and parents. Services include talks, workshops and treatment groups. More information is available at:

- <http://www.tungwahcsd.org/en/our-services/youth-and-family-services/integrated-services-for-family-and-young-people/SSWS/services>
- <http://cyberaddiction.tungwahcsd.org/>

44. TWGH also launched the Integrated Centre on Addiction Prevention and Treatment (ICAPT) in October 2012, aiming to provide professional treatment services for multiple addictions, including internet addiction, and comorbid mental health disorders to the general public. ICAPT has a multi-disciplinary team consisting of psychiatrists, social workers, a clinical psychologist and a psychiatric nurse to provide a one-stop comprehensive assessment and treatment program including hotline counseling, individual and family counseling, health assessment and psychological and psychiatric assessment and treatment. More information is available at <http://icapt.tungwahcsd.org/page.aspx?corpname=icapt&i=479&locale=en-US>

#### Hong Kong Family Welfare Society (HKFWS)

45. HKFWS has developed the “Net” Education and Counselling Service since 2004, with the aim of arousing public concern in internet problems, including net addiction and cyber-bullying, preventing youth-net-problems and reducing the generation gap in the digital era.

46. Since 2005, HKFWS has trained over 100 young people and parents ambassadors to promote the healthy use of internet in communities and schools, and over a hundred talks and activities on healthy use of the Internet have been organized. Educational CD and booklets were also produced and distributed to schools and local groups.

47. In 2009, the HKFWS conducted a survey to understand the situation of cyberbullying in adolescent. To follow up the survey findings, HKFWS promotes healthy use of the internet culture in schools, conducts training for teachers, and promotes a zero tolerance approach to deal with cyberbullying.

48. Commissioned by the Education Bureau, HKFWS launched a counselling hotline in December 2011 on Healthy Use of Internet with service modes include telephone hotline and WhatsApp. More than 1,000 calls were received each year

49. HKFWS also developed a webpage on Healthy Internet for Family to promote effective learning through the internet, as well as foster children and young people to develop the health and safety of the internet attitudes and habits, so as to achieve family harmony. More information is available at:

- [http://www.hkfws.org.hk/en\\_service.aspx?id=31&aaa=2](http://www.hkfws.org.hk/en_service.aspx?id=31&aaa=2)
- <http://healthynet.hk/>

#### Hong Kong Christian Service (HKCS)

50. In order to help young internet addicts regain their self-control on computer use, the Integrated Children and Youth Service (Happy Teens Club) of the HKCS has developed the "Online New Page Project" since February 2005.

51. The target clients of this service are young people aged between 6 and 24 years and their parents. The project provides counseling and supportive services for those who have constant indulgence in internet or found to be internet addicted.

52. Counseling services include counseling hotline, outreaching and counseling service, and online agent groups (groups for young people). Supporting services include talks and workshops, professional training/ sharing sessions, case enquiry, online buddy alliance, parent support network. More information is available at: <http://www.hkcs.org/gcb/icys/prog/online/stop-e.html>

#### **Public Organisation**

##### Hospital Authority

53. In Hong Kong, public hospitals and medical services are provided by the Hospital Authority, a government-funded public organization.

54. At the moment, there are no specific medical treatment services in the public hospitals in Hong Kong specifically for the problematic use of internet and its health consequences. However, if there are comorbid psychiatric conditions, then it may be referred to a psychiatrist in the general psychiatric service. There is a substance abuse clinic in every cluster in the hospital authority, internet addiction or related cases are, however, rarely encountered by the psychiatrists in the public sector.

55. Likewise, public hospitals in Hong Kong do not have specific medical treatment teams from paediatric or adolescent health units for this internet related health problem. General advice are given to parents when they raise this issue during medical consultation i.e. as part of a generic parenting issue.

#### **Conclusion**

56. Various government departments, public agencies, and non-government organisations in Hong Kong have been providing different programmes and services, including prevention and intervention, to address the issues relating to adverse health effects arising from use of internet and related electronic products.

57. In view of rapid development and penetration of the technology as well as increasing use of internet and related products by general public, there is a need to keep a close monitoring on the public health impacts of conditions associated with excessive use of the technology and products with a view to fine tuning the services.

58. Making reference to evidence and experience from others, various parties in Hong Kong should join hands to strengthen the prevention work as well as intervention services to reduce the adverse health impact from the use of internet and related electronic products.

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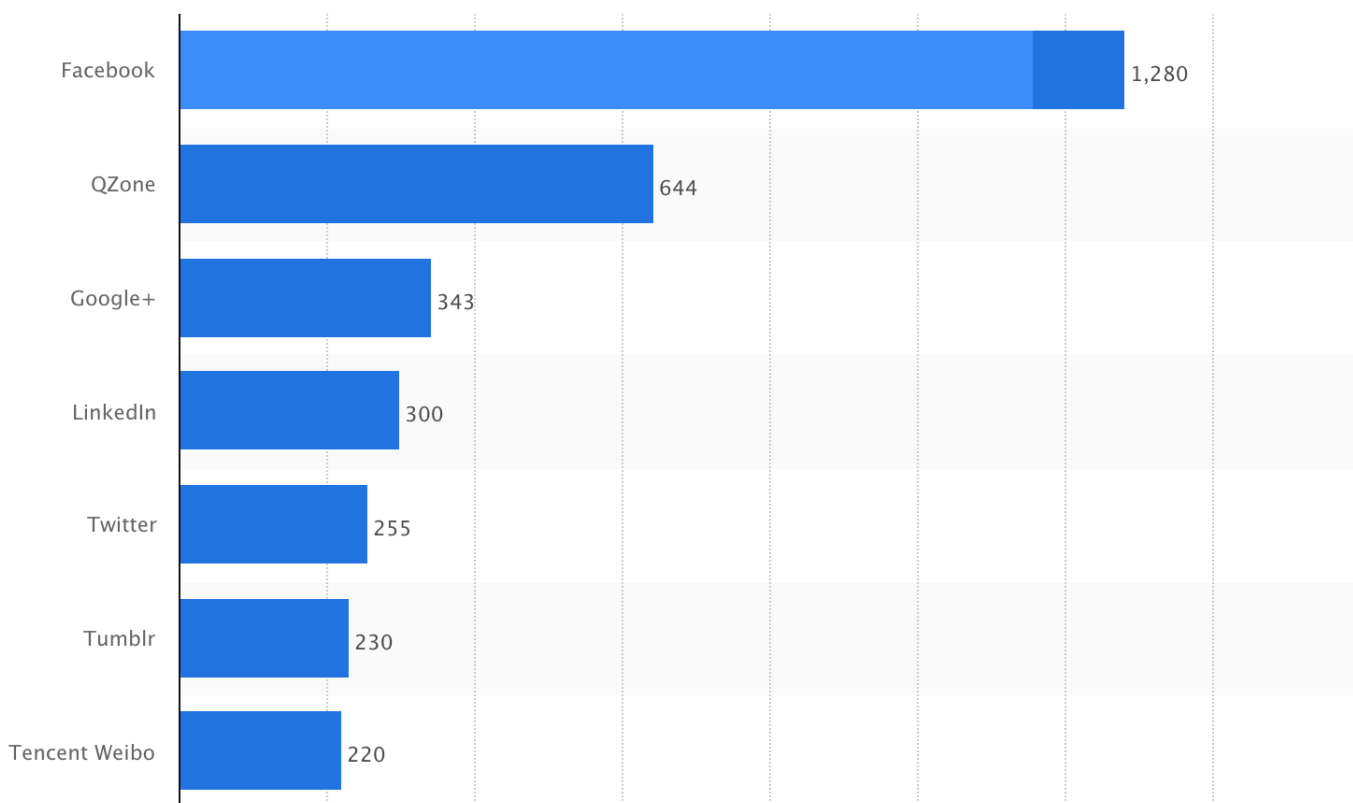
## Excessive use of smart phones and social networks and its impact on health

Susana Jiménez-Murcia<sup>1,2,3</sup> Fernando Fernández-Aranda<sup>1,2,3</sup> and Sophia Achab<sup>4,5</sup>

### Introduction

Communication has been profoundly redesigned the last two decades by dint of the emergence of new technologies of information and communication. World Wide Web created in Switzerland in 1989 and available for the public in 1993(CERN, 2014), made it possible to reach more, diverse, and immediate information; as well as instant interactivity with familiar or unfamiliar contacts through vocal or written messages; and to share opinions or news, to create or develop personal or professional networks through social networks sites (SNS). In 2014, the number of social networks users is estimated at 1.82 billion, with Facebook being the most popular (**Figure 1**) (Statista, 2014). Excessive use has been reported in the last decade literature. Social network site addiction (SNS-addiction) is described to generate health-related problems and negative consequences on interpersonal and academic spheres (Andreassen & Pallesen, 2014). It is being very recently scientifically investigated and the debate on its existence and consequences rages.

**Figure 1. Leading social networks worldwide as of June 2014, ranked by number of active users (in millions (Statista, 2014))**



Since 2002, the use of cell phones has made a spectacular progress, as well as the convergence of Internet and mobile telephony that has been achieved, which has had an even greater advancement

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(Fortunati & Taipale, 2014). According to these authors, the number of mobile users has reached saturation, therefore operators, manufacturers and application designers must now only improve the technical capacity of these devices. The estimated number of cell phone users in the world has increased significantly in the last decade (Benotsch, Snipes, Martin, & Bull, 2013). In 2013, over 50% of mobile users in the U.S. utilized smart phones, while in South Korea, the figures amounted to 65% (D. Kim, Lee, Lee, Nam, & Chung, 2014). In an interesting study (Radesky et al., 2014), observed that 70% of parents in a fast-food restaurant used a phone while eating, each with different levels of involvement or disconnection from the environment. These findings may reflect the widespread use of cell phones and demonstrate what we witness in our daily lives across varying contexts. Today, cell phones are considered smart phones or handhelds and an excessive use can cause serious physical and mental health problems (Billieux et al., 2014).

### Cell phone Addiction: A Systematic Review of the Literature

The aim of the present section is to provide a systematic review that explores the current literature on cell phone addiction and the excessive use of this technological tool, with reference to quantitative and qualitative studies in general and clinical populations.

#### Methods

The authors searched electronic databases (Medline, PsychINFO, PubMed, Science Direct and Web of Science) for relevant literature on the topic of cell phone addiction published up to the end of July 2014. The search strategy is shown in **Table 1**. Data were initially extracted independently by the two first authors of this paper (SJM and FFA). Discrepancies or disagreements were discussed with an independent researcher.

**Table 1. Selection criteria for the studies included in this review**

Category	Criteria
Study population	All races and ethnicities All ages General population, college student populations and clinical samples
Study geography	All nations
Language	English, German, Spanish, French, Italian
Period	1990-2014/July
Type of studies	Human studies (clinical and community); Qualitative and quantitative nature

The inclusion criteria used in this review were as follow: quantitative and qualitative studies, dated between 1990 and 2014/July, studies exploring humans with a design of a descriptive or experimental nature, journals written in the English, German, Spanish, Italian or French languages. For all studies identified for inclusion, a full text version was retrieved and all studies were reviewed with regard to their quality and eligibility for the review. The exclusion criteria used in this review were: opinion articles, technical publications about information and communications technologies (ICTs) or cell phones, book chapters and dissertations, letters without relevant data, studies focussed on positive (e.g. e-Health) or negative consequences of cell phone use (medical or behavioural problems), papers written in languages other than those mentioned above and case-studies.

Keywords searched were the following, in all possible permutations: smartphone AND system OR "cellular phone" OR "mobile" AND "phone" OR "sms" OR message AND service AND "addictive behavior" OR "addiction" OR "utilization" OR "use" OR problem OR "substance-related disorders" OR "abuse" OR misuse. The total number of articles obtained from the combined search keys was 1368. Studies meeting the inclusion criteria were examined. After examining eligibility criteria, 330 studies were finally considered. From those, and after excluding 281 studies, a final total of 53 studies were selected and classified under five predetermined categories: Diagnostic and classification (3), Epidemiology (18), Risk and clinical factors (21), Assessment (10) and Therapy-prevention strategies (1). Any duplication was avoided.

**Characteristics of the studies**

From the 53 reviewed studies, 32 (60,4%) were published in the last 5 years. 90,6% (N=48) of the studies were published in English and the rest in Spanish (4) or French (1). Whereas 42 of the studies (79%) explored the prevalence of excessive phone use, the clinical features and the associated risk factors, 10 (19%) explored assessment and early detection and only 1 (2%) addressed treatment and prevention.

**Population studied**

Most of the considered studies assessed clinical and community populations from Europe and Asia, corresponding to almost 75% of the studies available and the population explored. Several world regions, such as Central and South America, Africa and Oceania (with exception of Australia) are underrepresented in the existing literature. The country distribution of studies on this topic is shown in **Table 2**.

**Table 2. Studies distributed regarding the continent and country where analysed**

Continent	Country	Total number of studies
Europe	Italy (3), Spain (7), Sweden (2), UK (5), Austria (2), Finland (1), Germany (1), The Netherlands (1), Hungary (1), Norway (1), Turkey* (2), Belgium (1)	27
Asia	India (2), South Korea (4), Taiwan (3), Iran (1), Japan (3), Thailand (1)	14
America	USA (6) Barbados (1)	7
Oceania	Australia (4)	4
Africa	Tunisian (1)	1

\* Although Turkey could be considered Europe or Asia, in this table the 2 studies published in this country were considered under Europe

The countries where most studies were conducted and therefore display greater research interest in phone use were South Korea, Spain, USA and UK. In **Table 3**, the studies are described according to the topic addressed and the studied population/country.

**Table 3. Studies distributed regarding topic explored and country where analysed**

Topic	Country	Total number of studies
Epidemiology	Italy (2), Spain (2), UK (3), Germany (1), Hungary (1), Turkey* (1), USA (2), India (1), Tunisian (1), Japan (2), Barbados (1), Thailand (1)	18
Classification	South Korea (1), Spain (1), UK (1)	3
Risk and clinical factors	USA (2), The Netherlands (1), Italy (1) Spain (2), Japan (2), Austria (2), South Korea (1), Sweden (2), Australia (4), Finland (1), Norway (1), Taiwan (2)	21
Assessment	USA (2), Turkey* (1), India (1), Spain (2), South Korea (3), Taiwan (1),	10
Treatment-prevention	South Korea (1)	1

\* Although Turkey could be considered Europe or Asia, in this table the 2 studies published in this country were considered under Europe

### *Diagnostic and classification*

Research on behavioral addictions is relatively recent. In fact, it was not until 1980 that the Diagnostic and Statistical Manual of Mental Disorders, in its third edition (DSM-III), formally recognized what used to be called pathological gambling, which remains the only behavioral addiction considered in the latest version of the manual (APA, 2013). However, in the third edition of the DSM, this addiction was placed under the heading "impulse control disorders not elsewhere classified". In May 2013, the fifth edition was presented, known as the DSM-5 (APA, 2013). In this new edition, a number of significant changes were made in the diagnosis of addictive disorders (related to both substance use and associated behaviors) after a committee of experts conducted a thorough analysis of the published empirical evidence (Petry & O'Brien, 2013). One of the most notable changes in this group of disorders was the introduction of a new classification category named "Substance Related and Addictive Disorders". In the pre-publication review of the DSM-5, all possible behavioral addictions were analyzed, including gambling, Internet gaming, a more general use of the Internet, shopping, exercise and work. The behaviors excessive eating and sex were dismissed on the grounds that there was insufficient data to show a similarity to Substance Use Disorders (SUDs). The inclusion of mobile phone addiction as another behavioral addiction was also proposed (Choliz, 2010). Finally, after reviewing the available research conducted up to date, only the gambling disorder was considered (reason for which in the DSM-5 it has been labeled pathological gambling) due to the clinical and phenomenological similarities, comorbidity and comparable treatment response with SUDs, which has also been corroborated by neurobiological findings (Leeman & Potenza, 2012) (Potenza, 2014). However, the working committee of the DSM-5 agreed to include the Internet Gaming Disorder (IGD) in the Section 3 of the manual, dedicated to those potential problems that require further investigation. This decision was based on the large number of studies on the topic and the serious consequences of this problem (Petry et al., 2014). Furthermore, in addition to the neurobiological similarities, IGT has a high comorbidity with SUDs and the gambling disorder, and the associated personality traits are alike (sensation seeking, impulsivity and low self-esteem) (Ko et al., 2014).

Although there is no agreement in the scientific community about the existence of an addiction to cell phones, also termed mobiles or smartphones in the literature (these will be used interchangeably in this article), there are multiple studies on the problematic use of next generation devices that have been conducted in Asian countries (where they are considered a public health problem), as well as in Europe and North America. The vast success of this type of technologies must be understood in the context that they allow quick access to the Internet, absolute mobility, communication with others, may be used for business, education, parental control, entertainment, relax and escape purposes and may even have clinical applications (Perez et al., 2012), and promote health (Rushing & Stephens, 2011). However, overuse can have various negative consequences because it may provoke school failure in the younger population and lower job performance, reduce non-virtual social relationships, promote family and couple conflicts and result in physical health problems, some of them due to traffic accidents (Billieux, et al., 2014).

Due to the clinical characteristics associated with the problematic use of mobile phones, for instance particular psychological consequences (emotional, personality, cognitive), that are similar to those of other substance or behavioral addictions (Choliz, 2010), several authors have proposed that it could be considered as an addiction (Mok et al., 2014). Following Griffiths (Griffiths, 2005a, 2005b) in his phenomenological description of addiction, the excessive or problematic use of mobile phones can be identified by symptoms of a heightened relevance or importance to the life of the individual, the presence of tolerance and withdrawal effects, conflicts due to their use and relapse. In a study of 10,191 adolescents in Taiwan, in which the symptoms described by Griffiths were explored, it was observed that 30% of the participants reported symptoms of tolerance, 36% withdrawal, 27% presented a greater use than intended, 18% failed in the attempt to control the behavior and 10% manifested interference and conflicts including within close social relationships (Yen et al., 2009).

Some authors (Meena, Mittal, & Solanki, 2012), postulated the symptoms to be low awareness of the time spent in use, high gratification (this activity has radically changed the use of free time, especially among adolescents and young adults), the decrease in non-virtual social relationships and an impact on academics, work and family. Pérez and colleagues (Perez, et al., 2012) added to these symptoms

the experience of anxiety and agitation when there is an abrupt withdrawal of the mobile phone, feelings of loss, interference with everyday activities and a loss of control.

However, despite the widespread use of the diagnosis of addiction, there are other approaches. For example, Billieux et al., 2014 doubts the conceptualization of addiction as any excessive behavior, concluding that this perspective can sometimes limit the results of treatment from a clinical point of view, since it simplifies the individual and psychological problems. Sanchez-Carbonell et al. (2008) (Sanchez-Carbonell, Beranuy, Castellana, Chamarro, & Oberst, 2008) suggest the use of the term "abuse" instead of "addiction", because this type of excessive and problematic behavior does not have some of the symptoms of addiction, for example, identity disturbances. Although Labrador Encinas et al. (2010) (Labrador encinas & Villadangos gonzalez, 2010) conceptualized mobile overuse as an addiction, they remark behaviors such as frequent checking as mechanisms to relieve discomfort (more similar to compulsive behaviors, which are maintained by the search of negative reinforcement).

### *Epidemiology*

Overall, epidemiological studies provide prevalence rates of cell phone addiction ranging between 0% and 38%. As risk factors, the personality trait of low self-esteem is associated with mobile addiction and high extroversion has been linked to overuse. At a psychopathological level, it seems that depression is the most common comorbid condition, with adolescent girls and young women with low self-esteem and depressive symptoms being the most vulnerable group (Perez , et al., 2012). The excessive use of mobile phones has been linked to various problems including driving, bullying, sexting, cyberbullying, headaches, postural changes, dizziness, concentration deficits, sleep deprivation, among other negative consequences (Takao, Takahashi, & Kitamura, 2009).

Kwon et al. (Kwon, Kim, Cho, & Yang, 2013) pointed out that in 2012, the National Information Society Agency estimated that 8.4% of the population had addiction problems related to smartphones, while 7.7% were related to the Internet in general. Kim (2013) (H. Kim, 2013) reported that 6.51% of Korean high school students used the mobile phone excessively and 1.81% of the users were at risk, with important consequences on their lives, such as poor academic performance and negative changes in the social and affective life.

Epidemiological studies in several countries show that addiction to cell phones affects more teens and young adults than the adult population (D. Kim, et al., 2014). As an example, these authors observed that in their study sample, 2.2% of the adolescents showed a high risk of addiction and 9.3% a moderate risk, whereas among the adults, only 1% presented an elevated risk of addiction and 6.7% a moderate risk. The Southeast Asian countries have identified that this is a serious public health problem, which requires that the government seek urgent regulatory mechanisms to protect the population, especially the young group, and the design and implementation of specialized treatment programs.

Another study identified that among 1.63 million Korean adolescents, 17.9% had a smartphone addiction (Mok, et al., 2014). Accordingly, in Japan there is a significant increase in the rates of the use of mobile phones, which in 2005 stood at 49.3% among adolescents in the 8th grade (Kamibeppu & Sugiura, 2005) rising to 84% among those aged between 13 and 19 years (Munezawa et al., 2011). In Thailand, higher rates of addiction and problematic cell phone use among college students were obtained, greater than those observed among high school students. Unlike what was observed in most studies, the rates were higher among men than women (Kawasaki et al., 2006). Differently, in another study (Mok, et al., 2014) the addiction to cell phones was more prevalent among women than men, whereas when Internet addiction was explored, the men were more affected.

Accordingly, several studies conducted in Europe suggest that the problematic use of mobile phones is also increasing, particularly within the adolescent and youth population. Adolescence, characterized by the pursuit of experiences and risk, is especially vulnerable to the use of new technologies (Benotsch, et al., 2013). Fortunati & Taipale, 2014 (Fortunati & Taipale, 2014) analyzed the increased use of mobile phones in Europe, finding Britain and France to be the countries where it is most used, followed by Germany, Spain and Italy. Another study reported that most people in Europe had more than one cell phone, with an average of 1.66 per capita in Finland, 1.31 in Switzerland and 1.13 in

Spain (Billieux, et al., 2014). In Hungary the prevalence rates for using cell phones was also found to be very high (Mezei, Benyi, & Muller, 2007). A study conducted in Spain (Sanchez-Martinez & Otero, 2009), analyzed the use of cell phones in a community sample of 1328 adolescents and young adults between the ages of 13 and 20 years (mean of 15.7 years). A total of 96.5% of the participants were found to have their own cell phone and 15.9% had more than one. 54.8% of the sample brought their mobile phone to school, 46.1% had it turned on during classes and 41.7% used it frequently during school time. Finally, 26.1% of girls and 13% of the boys displayed a dependence on cell phones.

Similarly, in another study published recently, conducted with a sample of 1,529 high school students, it was found that 10% of participants presenting problematic use were aged 11 to 14 years (Lopez-Fernandez, Honrubia-Serrano, Freixa-Blanxart, & Gibson, 2014). Furthermore, in a Spanish sample of 1710 students aged between 12 and 17 years (Labrador encinas & Villadangos gonzalez, 2010), found high rates of problematic use, which correlated positively with the time spent in use and the participants' own subjective perception of problem. According to these authors, this excessive behavior comprises the same symptoms to any other addiction, whereby the excessive use of the cell phone reflected a way for distracting and relaxation seeking and to regulate emotions.

One of the most frequent uses of cell phones is to browse the social networks such as Facebook and Twitter. Stimulation and immediate gratification and the ability to maintain constant contact with others has radically changed the form of communicating with others and the way people spend their leisure time. A study (Meena, et al., 2012), conducted with 200 subjects of both sexes, reported that 24.74% of the sample admitted having occasional or frequent problems with the use of social networks, while 2.02% presented severe problems. Only 1% of the sample stated that they did not frequent social networks. Furthermore, the most common problems among the teenagers consisted in unnecessary web searches, online pornography and online gaming. Other authors (Ahern & Mechling, 2013), also highlighted the serious problems of mobile phone use in adolescents, emphasizing the risk of sexting (text messages and pictures with sexual content). Additionally, Benotsch (Benotsch, et al., 2013) explored this behavior in a sample of 763 young people, concluding that 44% practiced sexting and, which was associated with substance abuse and sexual risky behavior.

Data published in other countries revealed similar patterns. For example, in Iran the rate of mobile phone use among young people is 31.4% and is more common among men (Mortazavi, Atefi, & Kholghi, 2011). In Uganda, between 2008 and 2009, 27% of high school students had a mobile. In addition, there was a significant increase in the rates of use, rising from 16% in 2002 to 80% in 2006 (K. J. Mitchell, Bull, Kiwanuka, & Ybarra, 2011). In Africa, 350 million active mobiles were reported in 2010, with a large proportion concentrated in South Africa (Napolitano, 2010). In Tunisia the use of cell phones among teenagers is also very high, which suggests the appearance of a new addiction (Halayem et al., 2010).

Although the scientific community agrees that cell phone use is an activity that is not without risk, especially among the young population, more and more empirical evidence emphasizes the benefits of cell phones and their potential for future rather than their negative consequences. The disparity in the results obtained from different studies may be associated with methodological bias, for example, the current conceptual vagueness on the concept of abuse and addiction to cell phones, the heterogeneity of the diagnostic criteria used and the variability in the employed assessment tools (Perez , et al., 2012).

#### *Clinical characteristics and associated factors*

Some studies (Bianchi & Phillips, 2005; Kwon, et al., 2013; Takao, et al., 2009) have observed an association between self-control problems and cell phone addiction. Mok and colleagues (Mok, et al., 2014) described a relationship between the intensity of the addiction and levels of both anxiety and neuroticism. However, previous studies such as that of Bianchi & Phillips (Bianchi & Phillips, 2005) have not obtained this connection. Furthermore, women in the study by Mok et al. (Mok, et al., 2014) scored clinically significant scores in psychoticism, which was explained by the severity of the symptoms, the presence of impulsivity and sensation seeking behavior and the self-control difficulties (described also in other studies, for example (Takao, et al., 2009). In addition, some authors (Perez , et al., 2012), highlighted the impatience (difficulty in delaying gratification-reinforcement) and low persistence seen among this population, consistent with the results published previously (Billieux, Van

der Linden, & Rochat, 2008). Along this line, the low tolerance for boredom and routine identified by Leung (Bian & Leung, 2014) should be taken into consideration. Other personality traits and emotional vulnerability factors identified, particularly among adolescents, have been low self esteem (Bianchi & Phillips, 2005; Ha, Chin, Park, Ryu, & Yu, 2008; Takao, et al., 2009; Yang, Yen, Ko, Cheng, & Yen, 2010), extraversion (Arns, Van Luijtelaaar, Sumich, Hamilton, & Gordon, 2007; Augner & Hacker, 2012; Bianchi & Phillips, 2005; Inyang et al., 2010) and a need for approval from others (Takao et al., 2009). Furthermore, Takao et al. (2009) (Takao, et al., 2009) also obtained positive associations with levels of aggression, insomnia, tobacco consumption and suicidal tendencies. Sleep disturbances, comprising the reduction of hours of sleep and exposure to electromagnetic emissions from the mobile phone overnight, have also been observed by other authors (Munezawa, et al., 2011). Studies have also noted an link between smoking, the consumption of other substances and mobile phone addiction (Leena, Tomi, & Arja, 2005; Sanchez-Martinez & Otero, 2009), while others have not found an association between self-esteem and cell phone addiction (Leung; Phillips, Butt, & Blaszczynski, 2006).

Some variables have been associated with the severity of the addiction to mobile phones, such as dropout from school, antisocial and criminal behavior, tattooing, sleep deprivation, substance use and risky behavior in sex (Yang, et al., 2010). In fact, in 2004, it was described an impaired socialization as an associated risk factor (Lee, Ahn, Choi, & Choi, 2014).

Other studies have reported a link between the problematic use of cell phones and drinking behavior (Sanchez-Martinez & Otero, 2009), depression (Ha, et al., 2008; Jenaro, Flores, Gomez-Vela, Gonzalez-Gil, & Caballo, 2007; Thomee, Harenstam, & Hagberg, 2011), alexithymia and a difficulty to express and recognize emotions in others (Mattila, Luutonen, Ylinen, Salokangas, & Joukamaa, 2010), chronic stress (Augner & Hacker, 2012), poor academic performance (Sanchez-Martinez & Otero, 2009; Thomee, et al., 2011) and low self-esteem (Ehrenberg, Juckes, White, & Walsh, 2008) in adolescents. Furthermore, other authors (Phillips, et al., 2006) have identified the presence of high extraversion and low agreeableness.

Some risk factors, including being female, perceived self-control, the use of text messages, time spent with the mobile phone, expenses, number of contacts, perceived self-efficacy and depressive symptoms have been described (Geser, 2006; Sanchez-Martinez & Otero, 2009; Takao, et al., 2009; Thomee, et al., 2011).

In agreement with some obtained findings (Leung), the group most at risk was women with low self-esteem. Other authors emphasized that the negative consequences are greater for women (Beranuy fargues, Chamarro luser, Graner jordania, & Carbonell-sanchez, 2009) and differential patterns of use between genders have been reported (Ruiz-Olivares, Lucena, Pino, & Herruzo, 2010). In this regard, in their longitudinal study Thomée and colleagues (Thomee, et al., 2011) described that among men the risk was associated with the number of hours of use, while among women it depended on the intensity of use, for example, continued use.

Several studies have explored the negative consequences of excessive use of these devices. Some authors (Lee, et al., 2014) noted cervical musculoskeletal problems in mobile phone addicts. A relationship between the severity of the addiction and postural errors was also reported. Other research has demonstrated the existence of an association between sleep disturbances and the use of the mobile phone in the evening (Munezawa, et al., 2011). Some authors (Mortazavi, et al., 2011), also noted the relationship between mobile phone use and physical problems such as headaches, dizziness and also sleep disturbances. Ayanda and colleagues (Ayanda, Baba, & Ayanda, 2012) did not identify a connection between cancer and mobile phone use, however the author recommended that the results should not be interpreted as the absence of a risk. Harrison (Harrison, 2011) reported a relationship between mobile phone use and traffic accidents, findings already described by other authors (Beck, Yan, & Wang, 2007).

However, the use of smart phones has its benefits, from increasing the efficiency of some treatment programs for chronic diseases such as diabetes (Krishna & Boren, 2008), the control of tobacco and alcohol consumption (Gustafson et al., 2014), obesity (Batch et al., 2014) and could also be used for training certain cognitive skills (Green & Bavelier, 2008). Regarding cell phone use and cognition, a

study showed that frequent mobile users had better executive functions, especially in terms of maintaining attention levels (Arns, et al., 2007). The authors proposed that this was due to the habit of such high intensity users of receiving calls and writing messages despite being in environments with high levels of distractibility. Mitchell and colleagues (S. J. Mitchell, Godoy, Shabazz, & Horn, 2014) highlighted the usefulness of using cell phones in pediatrics, emphasizing the improvement of communication between the specialists and the parents, and the need to expand the use of cell phones in medical practice. Furthermore, (Ramesh et al., 2008) highlighted the strong potential of mobiles in the field of medicine; however he indicated that there are some negative consequences. For example, the author noted that 98% of the medical staff in a general hospital in Barbados used a mobile phone during the day and only in 67% of the cases it was for reasons related to the hospital (for example, 47% while visiting patients), but only 3 % washed their hands after using them, which increased the risk of contamination by bacteria and germs.

#### *Assessment*

Multiple assessment instruments have been applied across published studies, many of them adapted from scales and questionnaires on Internet addiction. The most used and those adapted to various languages will be described. The first instrument designed to assess addiction was the mobile phone Mobile Phone Dependence Questionnaire (MPDQ) (Toda, Monden, Kubo, & Morimoto, 2006). It is a 20-item scale with a Cronbach's alpha of 0.86. In Australia Bianchi and Phillips (2005) (Bianchi & Phillips, 2005), created the Mobile Problem Use Scale (MPPUS), one of the most frequently used scales in this area. It consists of 27 items, with a Cronbach's alpha of 0.90. Another scale it was published by Halayem (Halayem, et al., 2010), the Self-perception of Text-message Dependency Scale (STDS), which has 15 items. Unfortunately, validation data on this scale were not available.

Rutland et al. (Rutland, Sheets, & Young, 2007), developed an instrument to evaluate the use of SMS, namely SMS Problem Use Diagnostic Questionnaire (SMS-PUDQ), for which acceptable levels of validity and reliability were obtained. In Spain (Beranuy fargues, et al., 2009), they were created two questionnaires to assess mobile phone and Internet addiction. For the first one, the objective was to evaluate the consequential intra-and interpersonal conflicts, while in the second questionnaire, the authors explored the emotional and communication problems associated with addictive Internet use. The authors concluded that, in general, the addiction to the mobile phone is more moderate compared to an Internet addiction when considering the analyzed factors, and therefore suggested using the term "problematic use" instead of "addiction", unlike what has been done with excessive Internet use. Furthermore, adolescents are particularly vulnerable to both problematic behaviors. For this reason (Lopez-Fernandez, Honrubia-Serrano, & Freixa-Blanxart, 2012), it was adapted and validated the Mobile Phone Problem Use Scale (MPPUS) for Spanish adolescents. In this version, the scale only has one dimension and the scores of reliability and validity were comparable to those obtained in the adult population. In Turkey (Guzeller & Cosguner, 2012), adapted the Problematic Mobile Phone Use Scale (PMPUS) for the adolescent population and shortly after (Kwon, et al., 2013) explored an abbreviated and adapted version of the Smartphone Addiction Scale (SAS). Similarly in adults, Merlo et al (Merlo, Stone, & Bibbey, 2013), developed and assessed the 20-item scale named self-report Problematic Use of Mobile Phones (PUMP), with excellent internal consistency with a Cronbach's alpha of 0.94.

Lin et al. (Lin et al., 2014) developed and validated the Smartphone Addiction Inventory (SPAI) on a sample of 283 participants. The scale comprises 26 items, modified from the Chinese Internet Addiction Scale. Four factors were identified: Compulsive behaviour, functional impairment, withdrawal and tolerance. The coefficients of internal consistency and reliability were satisfactory, with a Cronbach's alpha of 0.94. Another scale that has been recently put together is the Korean Smartphone Addiction Proneness Scale for youth (SAPS) (D. Kim, et al., 2014). With 15 items, 4 subscales were obtained: Disturbance of adaptive function, virtual life orientation, withdrawal and tolerance. This scale had an elevated reliability, with a Cronbach's alpha of 0.880. In Middle East (Mazaheri & Karbasi, 2014) it was validated the Persian Version of the Mobile Phone Addiction Scale (adapted from the English version of the Mobile Phone Addiction Inventory) on a sample of 1.180 students, obtaining a Cronbach's alpha of 0.86.

In conclusion, it appears that multiple assessment instruments have been developed, many of which were built based on the examination of the behavioral patterns of mobile phone users, or adapted

from either the DSM-IV (APA, 1994) or DSM-IV-TR criteria (APA, 2000) for pathological gambling, or the criteria from Kimberly Young (Young, 1996) for Internet addiction. This disparity in the assessment tools used makes it more difficult to establish uniform criteria for the diagnosis of an addiction to the mobile phone and to carry out epidemiological studies that are comparable across countries.

#### *Treatment and prevention*

Unlike studies on the epidemiology and clinical risk factors to excessive cell phone use, which in the past 5 years have significantly increased, there is a lack of studies researching treatment and prevention programs. One of them is Kim (H. Kim, 2013), which reviewed various treatment programs that might be useful for addressing addictions to cell phones and emphasized the potential effectiveness of exercise for the improvement of the symptoms. As described in the study, the treatments applied up to now are strictly behavioral, cognitive-behavioral, motivational, based on mindfulness (meditation and awareness of feelings and cognitions), relapse prevention (programs to handle the craving), other alternative treatments or complementary therapies such as art or music (with drums) therapy and, finally, physical rehabilitation. However, due to the theoretical nature of Kim's (2013) study (H. Kim, 2013), it is not possible to establish the effectiveness of the described interventions.

Nonetheless, Lee et al. (Lee, et al., 2014) developed a program to improve self-monitoring, termed: Smartphone Addiction Management System (SAMS). It is an android application linked to a web server. This application allows the monitoring and control over the use of the mobile, with an additional GPS location system. The information is transferred to the server SAMS. Through the program, the patient can also collect data for statistical analysis regarding his use of the mobile phone. Besides helping to enhance self-observation and self-control, the application facilitates the examination and monitoring of an internet-based intervention. This system was validated on a sample of patients, from which it was noted that the duration of use was not related to the levels of addiction, although there was a relationship between dependence and daily use.

Regarding prevention strategies, the following measures are usually recommended to teachers and parents: to monitor the websites that are consulted and the time spent connected to the Internet in the mobile phones, and to increase the dialogue and communication with the adolescents (recognizing and accepting their needs, but helping them to recognize the risks of excessive use) (Meena, et al., 2012). Additional prevention strategies addressed to adolescents and young adults, entail promoting psycho educational programs that provide information about the risks of excessive mobile phone use and teaching measures to take to achieve a safe use, which include: to avoid regular and prolonged calls, to only give the mobile phone number to trusted others, to keep the cell phone turned off whenever possible, to monitor the type of messages that are being sent and received and to tell adults immediately if cyber bullying is detected.

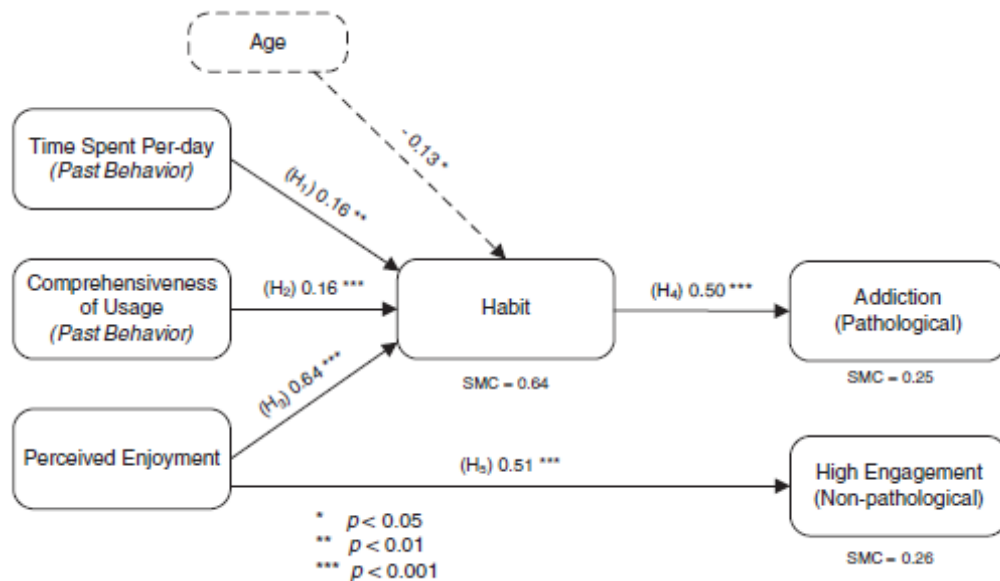
#### **Social network site addiction, an overview**

Literature on the SNS-addiction is still in its infancy and a recent review (Andreassen & Pallesen, 2014) summarized the actual knowledge on the field.

To understand the development of such disorder, an interesting research model (Turel & Serenko, 2012) has tested the theorization of the process leading to a social network site addiction from the starting point of enjoying the activities in those networks, being then a regular consumption and leading in some cases to excessive use and even addiction (**Figure 2**). Three models could explain the emergence of the disorder (a) cognitive-behavioral model (cognitive distortions amplified by environmental factors), (b) social skill model (lack of self-presentational skills and preference for virtual interpersonal interaction), and (c) socio-cognitive model (expectations of positive outcome associated with Internet self-efficacy and disordered Internet self-regulation) (Turel & Serenko, 2012).



**Figure 2. Research model of social network site addiction (Turel & Serenko, 2012)**



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(a) social relationships (reciprocity with others), and (b) parasocial relationships (unidirectional e.g. with famous people). They found that addiction to parasocial relationships were positively associated with a feeling of loneliness and negatively correlated with interpersonal distrust, while addiction to social relationships was negatively correlated with loneliness and positively associated with interpersonal trust (Baek, et al., 2013).

In addition to the adverse effects on psychological well-being and social life previously described to be associated to excessive use of Internet (Carli et al., 2013; Ko, Yen, Yen, Chen, & Chen, 2012; Lorains, Cowlshaw, & Thomas, 2011), some negative consequences have been described to be experienced specifically by SNS-addicts : poor quality of sleep, anxiety and proneness to depression (Selfhout, Branje, Delsing, ter Bogt, & Meeus, 2009; Wolniczak et al., 2013) and exacerbation of bronchial asthma (D'Amato, Cecchi, Liccardi, D'Amato, & Stanghellini, 2013).

**Assessment**

There is no validated tool to assess SNS-addiction. Attempts to screen for this disorder have used instruments to assess Internet addiction (Kittinger, Correia, & Irons, 2012) (Turel & Serenko, 2012) or adapted some of them to specific social networks like Facebook. Some examples are: Bergen Facebook Addiction Scale (BFAS) (Andreassen, Torsheim, Brunborg, & Pallesen, 2012) , Facebook Addiction Symptoms Scale (Alabi, 2012) and Facebook Intrusion Questionnaire (Elphinston & Noller, 2011).

**Epidemiological data**

Emerging disorder and lack of assessment gold standard are factors explaining the paucity of available epidemiological data. Several methodological bias (e.g. small and non representative samples, disparity in assessment tools) in the studies published yields to the disparity in prevalence rates. In a Chinese sample of 335 college students, 34% of them were considered addicted (Wan, 2009), while 1,6% of Nigerian University students were assessed as Facebook addicts (Alabi, 2012) and 8,6% of Peruan University students were considered as Facebook dependent (Wolniczak, et al., 2013). In a Turkish sample of college students, 22% of the variance of Facebook addiction was explained by weekly time engagement, social motives, anxiety, insomnia and severe depression (Koc & Gulyagci, 2013).

**Prevention and treatment**

Controlled use should be the core element of prevention and treatment in SNS-addiction, since abstinence is not realistic in an era of connectivity for personal and professional purposes. Clinical studies and efficacy trials are lacking, but some psychosocial interventions that showed efficacy on

Internet addiction (King & Delfabbro, 2014; Winkler, Dorsing, Rief, Shen, & Glombiewski, 2013) as in substance use disorders have all chances to apply (i.e. cognitive and behavioral therapy and motivational approach).

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## **Disorders associated with excessive use of internet, computers, smart phones and similar electronic devices**

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### **1.0 Introduction**

The rising popularity and use of electronic devices, such as computers, smart phones and tablets, in conjunction with the widespread availability of the internet as an electronic medium, has seen an increasing clinical, research and media focus on excessive use and associated problems. Interest in the behavioural consequences of such use has primarily been in excessive use of the internet, rather than excessive use of the devices via which the internet is accessed.

Problematic internet use, also known as “pathological internet use”, “internet addiction”, “internet addiction disorder” and “internet dependence”, among others, is typically described as “excessive or poorly controlled preoccupations, urges, or behaviours regarding internet use that lead to impairment or distress” (1), although there is still a lack of consistent terminology or widely accepted definition to describe the phenomenon.

Historically, the majority of internet users have been adolescents and young adults, reflecting the environment, one with a well-developed and widely available internet, in which they have grown up (2). Research shows, however, that internet usage is rising among older populations (3). Nevertheless, the majority of studies examining problematic internet use to date have focused on young users, males in particular, among mostly Asian samples.

Globally, the reported prevalence of the behavioural syndrome regarded as problematic internet use or internet addiction ranges from 1.5-8.2% (1, 2), although the reliability of global estimates has been questioned due to methodological issues, such as inconsistent measurement using various assessment tools, most of which have not been validated, and probable sampling bias. Moreover, prevalence studies have yielded conflicting results and there is a dearth of large epidemiological studies, making estimation of the general population prevalence difficult (4).

Prevalence estimates also vary widely both within and between different geographical regions. In Europe, the reported prevalence of internet addiction ranges from 1% in Norway to 12% in Turkey. Similarly, prevalence in the Middle East is estimated at 1-12%. In Asia, the reported prevalence is 2-11% in China and 7-23% in Hong Kong. In the UK, a prevalence of 18% has been reported and, in the US, estimates range from 0.3% to 26% (5-7). Online surveys typically yield higher estimates than offline surveys, indicating potential self-selection bias.

Internet/ online gaming has become one of the most popular forms of recreational activity, irrespective of age, gender and culture, and the most commonly reported form of problematic internet-related activity (8). As with problematic internet use more generally, there is wide variability in the reported prevalence of internet gaming “addiction”, depending on the criteria used and the study sample (9).

The following sections outline the current evidence base for the phenomenology, identification, classification and management of disorders associated with excessive use of electronic media.

### **2.0 Phenomenology**

“Internet addiction” is a broad term that refers to a persistent pattern of maladaptive behaviour relating to internet-related activity. It was first described in the late 1990’s (10-12) and is characterised by either an irresistible preoccupation with, or excessive use of, the internet for longer periods of time than planned, where such use or preoccupation leads to clinically significant distress and/or impaired functioning.

Internet addiction is typically discussed in terms of at least three subtypes - 1. excessive gaming/gambling; 2. sexual preoccupations (e.g. viewing pornography); 3. socialising or social networking (e.g. emailing, messaging, frequenting “chat” rooms) (1, 13). These subtypes share the following components:

1) *excessive use* - often associated with a loss of the sense of time or a neglect of basic drives (e.g. appetite, sleep);

- 2) *withdrawal* - including feelings of anger, tension, and/or depression when the computer is inaccessible;
- 3) *tolerance* – including the need for better computer equipment, more software or more hours of use; and
- 4) *negative repercussions* - including lying, starting arguments, poor academic/occupational achievement, social isolation and fatigue.

### **2.1 Clinical presentation**

In terms of clinical presentation, those identified as being “addicted” to the internet may use the internet for extended periods, isolating themselves from other forms of social contact and focusing almost entirely on internet-related activity to the exclusion of broader life activity (1, 14). They differ from other internet users in terms of the time spent online and the type of internet activities they engage in, spending more hours online and being more likely to use the internet for excessive gambling and gaming, pornography, and role-playing fantasy games (3).

### **2.2. Adverse consequences**

Adverse consequences documented in the literature include structural changes in the adolescent brain (15) and a negative impact on cognitive functioning, academic performance, eating habits and interpersonal relationships. Adolescents with internet addiction have demonstrated dysfunctional coping strategies with problems at home and in school and poorer quality interpersonal relationships (1, 14). Excessive internet use in adults has been associated with marital problems, social isolation, unemployment, financial problems, poor parenting and sleep deprivation. Moreover, spending excessive amounts of time on the internet may lead to physical problems such as back pain, eye strain and carpal tunnel syndrome (10). Additionally, excessive internet use has been associated with an increased risk of self-harm and increased risk-taking (16). The playing of violent internet games, in particular, has been associated with increased aggression (5).

Internet gaming addiction is the most widely researched form of internet addiction, with a dearth of literature on the other subtypes. As such, much of what is known about the phenomenology of excessive internet use is in the context of internet gaming.

Internet gaming addiction is associated with large amounts of time spent gaming (up to 16 hours per day) with a consequent disruption of sleep patterns where users may stay online until 3 or 4 am. In extreme cases, caffeine pills have been used to enable users to engage in longer internet sessions. Users “addicted” to the internet also have a shortage of social and intimate contacts.

There has been some investigation of “smartphone addiction” as a disorder that is similar but phenomenologically distinct from internet addiction. In the limited number of studies to date (17-19), however, it is impossible to disentangle the use of smartphones *per se* from use of the internet via these devices and determine the phenomenology that would be unique to smartphone addiction. As such, the following discussion of the disorders associated with the excessive use of computers, smartphones and similar devices will be presented in the context of excessive internet use, rather than excessive use of the electronic devices themselves.

## **3.0 Nosology**

### **3.1 Internet addiction**

As with other behavioural addictions, internet addiction is regarded as a disorder which lies on the impulsive-compulsive spectrum (13). Griffiths (20) proposed that all addictions, substance-related and non-substance-related (i.e. behavioural), have a distinct set of components in common (salience, mood modification, tolerance, withdrawal, conflict and relapse) and that internet addiction and other pathological behaviours (e.g. gambling) can all be understood within this model. Whilst many argue that these components are core to the phenomenology of internet addiction (3, 21), internet addiction is not formally recognised as a disorder by existing psychiatric classification systems – i.e. the International Classification of Diseases (ICD) and the Diagnostic and Statistical Manual of Mental Disorders (DSM).

### **3.2 Classification of behavioural addictions**

In response to the increasing recognition and evidence that some behaviours, such as gambling, activate brain reward mechanisms in similar ways to psychoactive substance use, the substance-related disorders chapter in the DSM has been broadened in DSM-5 to include other addictive disorders (22). This chapter, which is now labelled *Substance-Related and Addictive Disorders*, includes non-substance-related disorders in addition to the various substance-related disorders. The inclusion of gambling disorder in this chapter was driven by consistent evidence that gambling disorder resembles substance

use disorders in terms of clinical phenomenology, pathophysiology, comorbidity and treatment (9). At present, however, gambling disorder is the only behavioural addiction recognised in DSM-5 as a diagnosable condition, as it was concluded that there was insufficient evidence to establish the diagnostic criteria and course descriptions needed to identify other behaviours, such as excessive internet use, as mental disorders (22). Similarly, in the forthcoming edition of ICD (ICD-11) a new chapter including behavioural addictions alongside substance use disorders is planned, but will only include gambling as a specified disorder. The recognition of gambling disorder as a behavioural addiction invites consideration of other compulsive behaviours to be included as addictive disorders in future revisions of these classification systems (21).

### **3.3 Internet Gaming Disorder**

Internet Gaming Disorder was included in Section III of DSM-5 due to the large number of studies of the condition and the clinical significance its consequences, which have included seizures and deaths following long periods of internet gaming lasting days without eating or sleeping. The proposed DSM-5 criteria for Internet Gaming Disorder (Figure 1) have been adapted from the criteria for internet addiction proposed by Tao et al. (23). There is evidence to suggest that internet gaming is characteristically different from other excessive online or electronic activities, such as social networking, gambling, viewing of pornography, and shopping, in terms of etiology, prevalence, course, clinical presentation, comorbidities, participant characteristics and risk of harm (24). As such, the proposed criteria for internet gaming disorder only apply to internet gaming and not internet use more generally. In the guide to differential diagnosis, DSM-5 specifies that excessive use of the internet that does not entail the playing of online games (e.g., excessive use of social media; viewing pornography online) is not considered analogous to internet gaming disorder and that excessive online gambling may qualify for a separate diagnosis of gambling disorder (22).

## **DSM-5 SECTION III: CONDITIONS FOR FURTHER STUDY**

### **Internet Gaming Disorder**

#### **Proposed Criteria**

Persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following in a 12-month period:

1. Preoccupation with Internet games. (The individual thinks about previous gaming activity or anticipates playing the next game; Internet gaming becomes the dominant activity in daily life).

**Note:** This disorder is distinct from Internet gambling, which is included under gambling disorder.

2. Withdrawal symptoms when Internet gaming is taken away. (These symptoms are typically described as irritability, anxiety, or sadness, but there are no physical signs of pharmacological withdrawal.)

3. Tolerance—the need to spend increasing amounts of time engaged in Internet games.

4. Unsuccessful attempts to control the participation in Internet games.

5. Loss of interests in previous hobbies and entertainment as a result of, and with the exception of, Internet games.

6. Continued excessive use of Internet games despite knowledge of psychosocial problems.

7. Has deceived family members, therapists, or others regarding the amount of Internet gaming.

8. Use of Internet games to escape or relieve a negative mood (e.g., feelings of helplessness, guilt, anxiety).

9. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in Internet games.

**Note:** Only non-gambling Internet games are included in this disorder. Use of the Internet for required activities in a business or profession is not included; nor is the disorder intended to include other

recreational or social Internet use. Similarly, sexual Internet sites are excluded.

**Specify current severity:**

Internet gaming disorder can be mild, moderate, or severe depending on the degree of disruption of normal activities. Individuals with less severe Internet gaming disorder may exhibit fewer symptoms and less disruption of their lives. Those with severe Internet gaming disorder will have more hours spent on the computer and more severe loss of relationships or career or school opportunities.

Figure 1. DSM-5 proposed criteria for Internet Gaming Disorder

The potential adoption of Internet Gaming Disorder and internet addiction more broadly as categorical rather than dimensional constructs within psychiatric classification systems, such as DSM and ICD, raises a number of issues for consideration. These include whether such diagnoses will have predictive validity with respect to clinical course and prognostic factors, as well as the potential for overdiagnosis in clinical practice due to the coding requirements for reimbursement of diagnostic and treatment services.

**3.4 Classification of internet addiction as a behavioural addiction**

As noted above, the phenomenological features of internet addiction can be grouped into the following categories: 1. excessive use; 2. withdrawal; 3. tolerance; and 4. negative repercussions.

Excessive use is analogous to the construct of impaired control over use and cognitive salience or preoccupation that is core to a diagnosis of substance use disorder and gambling disorder. Whilst DSM-5 has included “craving” as a criterion for substance use disorders, craving is not part of the phenomenology or diagnostic criteria for behavioural addictions.

As with the criterion of withdrawal for gambling disorder, the withdrawal syndrome for internet addiction and internet gaming disorder is defined as psychological, rather than pharmacological, in nature. Similarly, tolerance with respect to gambling disorder and internet-related addiction is described as a psychological construct as opposed to a pharmacological dose-response. In the context of gambling, tolerance refers to the need to gamble with increasing amounts of money in order to achieve the desired excitement. Tolerance in the context of internet gaming refers to the need to play games for longer periods of time to experience excitement and may also involve the need for more exciting games or more powerful media equipment.

The negative repercussions associated with internet addiction and internet gaming disorder largely overlap with those associated with substance use disorders with respect to social impairment and with gambling in terms of deception and jeopardising relationships, career and education/occupational opportunities.

In terms of how the phenomenology of internet addiction, and internet gaming disorder more specifically, map onto DSM-5 criteria for substance use disorders and gambling disorder, Tables 1 and 2 provide a schematic representation of the overlap and distinctions between criteria for substance use disorder criteria, gambling disorder and internet gaming disorder. In Table 1, DSM-5 substance use disorder criteria are listed and an indication of whether there is a corresponding criterion for gambling disorder and internet gaming disorder (✓ or x) provided. Table 2 presents the criteria for gambling disorder and internet gaming disorder that are not specified among the criteria for substance use disorders and the extent to which they do or do not overlap (✓ or x).

Overall, the clinical features considered essential to problematic internet use and internet gaming overlap with the diagnostic criteria for substance use disorders and gambling disorder to a substantial degree. As is the case with gambling disorder, however, internet and internet gaming addiction is distinguished from substance use disorders by the lack of a pharmacological tolerance and withdrawal syndrome.

**Table 1: Overlap between DSM-5 criteria for *Substance Use Disorders (SUD)* and criteria for *Gambling Disorder* and proposed criteria for *Internet Gaming Disorder*.**

	SUD	Gambling Disorder	Internet Gaming Disorder
<b><i>Impaired control</i></b>			
Using larger amounts/over longer period	✓	✓ <sup>a</sup>	✓ <sup>a</sup>
Inability to reduce/cut down	✓	✓	✓
Great deal of time obtaining, using, recovering from effects	✓	✓ <sup>b</sup>	✓ <sup>b</sup>
Craving	✓	x	x
<b><i>Social impairment</i></b>			
Failure to fulfil major role obligations	✓	x	x
Continued use despite social/interpersonal problems	✓	x	✓
Important social, occupational or recreational activities given up or reduced	✓	x	✓
<b><i>Risky use</i></b>			
Continued use in physically hazardous situations	✓	x	x
Continued use despite physical or psychological problems	✓	x	✓
<b><i>Pharmacological criteria</i></b>			
Tolerance:- a) need for markedly increased amounts to achieve intoxication/desired effect <u>or</u> b) markedly diminished effect with continued use of same amount	✓	x	x
Withdrawal:- a) characteristic withdrawal syndrome for the substance <u>or</u> b) substance taken to relieve/avoid withdrawal symptoms	✓	x	x

<sup>a</sup> Considered analogous to “tolerance” in SUD; <sup>b</sup> defined as “preoccupation”

**Table 2: Overlap between DSM-5 criteria for *Gambling Disorder* and proposed criteria for *Internet Gaming Disorder*.**

	Gambling Disorder	Internet Gaming Disorder
Deception	✓	✓
Escape or relief from a negative mood	✓	✓
Jeopardised or lost a relationship, job or educational or career opportunity	✓	✓
Psychological symptoms of withdrawal	✓	✓
<b><i>Criteria specific to gambling disorder</i></b>		
Chasing one’s losses	✓	x
Relies on others for money to relieve desperate financial situations caused by gambling	✓	x

#### 4.0. Distinction between Excessive and Pathological Internet Use

There has been a lack of consensus with regard to the definition of problematic or addictive internet use, with debate over the nature of excessive use and whether or not it involves addiction (25). Similarly, prior to the inclusion of proposed criteria for Internet Gaming Disorder in DSM-5, there was a lack of a well-established definition of, or differentiation between, enthusiastic game play, problematic game use and gaming addiction (26).

Moreover, the mechanisms underlying the transition from adaptive to pathological internet use are still unclear (3). The development of addiction reflects a transition from impulsivity to compulsivity and is best understood from the study of substance-related addiction. Neurobiological research into the mechanisms of drug addiction has shown that addiction involves neuroadaptation of reward and stress circuits, such that changes in the drug reward set point and motivational systems are invoked (27). Such changes are hypothesised to induce an altered neurobiological state which makes the user vulnerable to the development of addiction. Whilst compulsive behaviour with impairment in functioning is evident in behavioural addictions, evidence for the same underlying neural mechanisms as substance-related addiction is inconclusive, with an absence of animal models and a lack of longitudinal research into the pathophysiology of internet addiction to establish causal pathways.

The transition to compulsive engagement in internet-related activity, such as internet gaming, may be influenced by the way the reward or reinforcement is delivered. It is well-recognised that certain forms of pathological gambling, such as casino games and slot/poker machines, are particularly resistant to extinction due to the nature of the reinforcement schedule integral to the game design. These games typically employ an intermittent (or partial) reinforcement schedule, whereby the reward (e.g. winning extra credits or payouts) is delivered only part of the time. This type of reinforcement schedule introduces an element of unpredictability as to whether the next response will result in a reward and can account for persistence in game playing (28). Online games are designed with similar reinforcement schedules where winning bonus points or gaining levels occurs in an unpredictable fashion, keeping the player interested and engaged in game play for longer periods.

It has been suggested, however, that problematic internet use reflects an underlying disorder, such as depression or anxiety, rather than being a disorder in and of itself, and that the internet is a mediating mechanism for other pathological behaviours, such as compulsive gambling, pornography viewing, shopping and gaming (5, 29). Festl et al. (26) argue that, in contrast to substance-related addiction, use of the internet, computers, smart phones and other electronic devices is not problematic in and of itself, as even frequent engagement in such use can be functional. Moreover, the time spent engaged in internet-related activity is not necessarily an indicator of pathology, with the context of the behaviour an important consideration (30).

## **5.0. Pathophysiology**

There appear to be similarities between the pathophysiology of internet addiction and substance-related addiction in terms of neurobiology, genetics and other physiology.

### **5.1 Brain structure and functioning**

Neuroimaging research has demonstrated that internet addiction is associated with changes in brain function and structure that are known neurobiological correlates of substance-related addiction (15).

#### *Structural changes*

Internet and internet gaming addiction have been found to lead to neuroadaptation and structural changes that occur as a consequence of prolonged increased activity in brain areas associated with addiction (15). A number of structural changes in the brain, indicative of neuroadaptation in the mesocorticolimbic system involved in reward and addiction have been observed (15). Structural magnetic resonance imaging (sMRI) studies have shown abnormal white matter integrity and a decrease in grey matter density of adolescents addicted to the internet compared to controls. Fibre connectivity in the corpus callosum has also found to be decreased in internet addicts relative to controls, suggesting that internet addiction may cause degeneration in neural connections between the left and right hemispheres of the brain. These structural changes correlated significantly with the duration of the problematic behaviour (15). In the absence of longitudinal studies, however, it is unclear whether internet addiction leads to brain alterations relative to controls or whether people with particular brain structure anomalies are predisposed to developing addictive behaviours.

### *Functional changes*

As with substance-related addiction, internet addiction is thought to be characterised by changes in reward system function, such that there is an overall reward deficiency that entails decreased dopaminergic activity. Excessive internet users show altered dopamine release in the nucleus accumbens and reduced availability of D2 receptors in the dorsal and ventral striata (15). Again, the direction of this relationship remains unclear (25).

Functional magnetic resonance imaging (fMRI) studies have demonstrated increased activity in brain regions associated with reward, addiction, craving and emotion among excessive internet game players compared to controls during game play and game cue presentation (15). These regions are also implicated in substance-related addictions and other behavioural addictions, such as gambling.

Electroencephalogram (EEG) studies have shown increased emotional processing of game-relevant cues among “addicted” internet gamers versus “casual” internet gamers (15).

### *Cognitive functioning*

Internet addiction has been associated with impairments in cognitive functioning in various domains – impulse control, behavioural inhibition, executive functioning, attentional capabilities and overall cognitive functioning (15). EEG studies, for example, have found reduced behavioural inhibition in those with internet addiction compared to controls. Studies using tests of visual and verbal memory have found poorer verbal memory among addicted internet users, but in small samples (31). fMRI studies have demonstrated enhanced reward sensitivity and decreased loss sensitivity among those labelled as “addicted” to the internet (15).

## **5.2 Sleep**

There is little empirical research on the effects of excessive internet use on sleep. A study using polysomnography found reduced slow-wave sleep and prolonged sleep onset latency in a small sample of adolescents (32).

## **5.3 Genetic polymorphisms**

The influence of genetics on internet addiction has not been investigated to the extent of that on substance-related addiction. A genotyping study of adolescent internet gamers found that those addicted to internet gaming had a higher prevalence of two polymorphisms of the dopaminergic system that are associated with substance use disorders.

## **6.0 Comorbidity**

### **6.1 Psychiatric**

The literature to date suggests that individuals with problematic internet use are at greater risk of comorbid psychopathology. Reviews of the literature (2, 3) conclude that internet addiction is most strongly and consistently associated with attention deficit hyperactivity disorder (ADHD) and major depression (2, 3, 22) and that, in all age groups, these associations are greater among males.

The findings of studies examining a potential association between internet addiction and the anxiety disorders are mixed. Approximately half of the studies reviewed by Carli et al. (3) found a significant association between internet addiction and anxiety. Among the few (n=3) studies that specifically included social phobia as an outcome variable, social phobia was not significantly related to internet addiction after controlling for depression and ADHD (3). Similarly, studies investigating obsessive-compulsive disorder and hostility/aggression have yielded conflicting results, with hostility/aggression being the most weakly associated with internet addiction (3). In summary, the available evidence suggests that anxiety, social phobia, obsessive-compulsive disorder and hostility/aggression are not strongly associated with problematic internet use (3).

Whilst comorbidity with other disorders has not been investigated to the same extent, there are reports of associations between problematic internet use and substance use disorders (1, 2, 16), suicidal ideation, schizophrenia and insomnia (16). Indeed, it has been suggested that sleep problems, such as insomnia and poor sleep quality, may mediate the relationship between internet addiction and depression, although the available studies do not enable causal pathways to be determined (33).



The overwhelming majority of studies investigating the association between internet addiction and psychiatric comorbidity have been cross-sectional studies. In the absence of longitudinal data, causal relationships cannot be established. Moreover, there is a great deal of heterogeneity in the definition and diagnosis of internet addiction (3). Regardless of the direction of causality, however, comorbidity is likely to complicate the screening and diagnosis of internet addiction.

## **6.2 Physical**

As mentioned above, internet addiction may cause physical health problems such as back pain, eye strain and carpal tunnel syndrome (10). It is also likely to have adverse effects on health due to the poor eating and sleeping habits associated with spending excessive amounts of time online.

## **7.0 Course**

It is widely agreed that the clinical course of what is regarded as internet addiction is not well-understood. The American Psychiatric Association has called for epidemiological research in order to understand the natural history of the disorder, with or without treatment (9, 22).

Internet addiction has been reported among children, adolescents and adults (34), although there are conflicting ideas about the onset of problematic use. It has been suggested that children and adolescents may be at increased risk for developing problematic use and that the onset is most likely during late childhood and early adolescence (5). Anecdotal evidence indicates that the time of onset of problematic use from first internet use is often within the first six months (35). In contrast, others propose that onset typically occurs in the late 20s or early 30s and that there is often a lag of a decade or more from initial to problematic use (36).

Whilst there is a lack of longitudinal data, uncontrolled and anecdotal studies suggest that internet addiction is a chronic, relapsing condition that is resistant to treatment and complicates the treatment response. High relapse rates are, in part, due to the high accessibility of the internet and the need to use it as a part of daily life, particularly in academic and occupational settings (5, 13, 35, 37).

## **8.0 Etiology/Risk Factors**

### **8.1 Age**

Adolescents have been identified as a group at high risk of developing problematic internet use and addiction due to high variability in developing cognitive control and boundary setting skills.

### **8.2 Gender**

Consistent with empirical data, which demonstrates that males are more susceptible to develop internet addiction (31), neuroimaging studies show stronger activation and connectivity of regions associated with mesocorticolimbic reward system among males relative to females (15).

### **8.3 Personality traits**

Neuroticism, anxiety, sensation-seeking, introversion, low emotional stability and hostility/aggression have all been associated with internet addiction (16).

### **8.4 Psychopathology**

The relationship between internet addiction and comorbid obsessive-compulsive disorder, withdrawal, anxiety and depression may be bidirectional (16). As such, individuals with these forms of psychopathology may be at greater risk for future internet addiction.

### **8.5 Environmental**

Those with widespread availability e.g. via WiFi, mobile phones are considered more likely to become addicted to the internet than those without extensive access (16).

## **9.0 Screening and Diagnosis**

Due to the lack of formal recognition of “internet addiction” as a psychiatric disorder, there are no “gold standard” procedures for the assessment of problematic/compulsive internet use. Nevertheless, numerous screening and diagnostic instruments, which are typically based on the diagnostic criteria for pathological gambling and substance use disorder, have been developed. To date, these instruments are based on self-report instruments, with no clinician-administered interviews (38). These include the Young’s Internet Addiction Test (IAT) (39, 40), the Compulsive Internet Use Scale (CIUS) (41), the Problematic Internet Use Questionnaire (PIUQ) (42), the Internet-Related Problem Scale (IRPS) (43) and the Problematic Internet Use Questionnaire – Short Form (PIUQ-SF) (44).

Whilst many of the available instruments have demonstrated good internal consistency and convergent validity (30), the majority have questionable validity in terms of their ability to distinguish between “normal” and “pathological” use of the internet (25), with a lack of clinically validated cut-off scores for discriminating between problematic non-problematic use (38). Moreover, very few instruments have undergone a comprehensive evaluation to assess all psychometric properties (38). In addition, they typically lack a measure of severity, any measurement of the user’s ability to control or cease the problematic behaviour, have no temporal dimension (i.e. onset and recency) to distinguish between lifetime and current symptoms, overestimate prevalence, and do not take the context in which internet use takes place into account (30, 45). Many of the scales do not account for the nature of preferred internet activities, pooling together all internet-related behaviours, e.g. gambling, viewing pornography, social networking, gaming and/or reading online news (3).

## **10.0 Early Identification**

Suggested targeted prevention approaches include identifying children at greatest risk, such as those with pre-existing psychosocial risk factors, and the monitoring and regulation of internet use (46).

## **11.0 Management/Treatment**

There are currently no evidence-based treatments for internet addiction (5). Randomised, controlled trials of pharmacological and psychological treatments are lacking, with the majority of proposed interventions based on personal clinical experience, small anecdotal studies or trials without randomised, double blind design (5, 47). In 2011, King et al. (45) conducted a systematic review of the literature on clinical interventions for internet addiction, evaluating the quality of reviewed studies using the “gold standard” Consolidating Standards of Reporting Trials (CONSORT) statement. Of the eight studies reviewed, two were pharmacological interventions using psychostimulants (methylphenidate) and antidepressants (bupropion). The other six studies were psychotherapeutic interventions using cognitive behaviour therapy (CBT), motivational interviewing, reality training or a treatment protocol involving a combination of psychological and/or counselling therapies. Only one of the studies (CBT vs control) used a randomised, controlled trial design, with the others employing minimal or no randomisation or blinding procedures. Overall, compliance with CONSORT guidelines was low, and several study limitations were identified. These include: 1. inconsistencies in the definition and diagnosis of internet addiction; 2. lack of randomization and blinding; 3. lack of adequate control groups; and, 4. insufficient information concerning recruitment, sample characteristics, and treatment effect size.

There are also case reports documenting the use of other antidepressants (escitalopram), antipsychotics (quetiapine) and naltrexone (47), with favourable results. Further, more rigorous investigation of the effectiveness of these forms of pharmacotherapy, however, are required before conclusions regarding their clinical utility in the treatment of internet addiction can be drawn.

Whilst there is still a lack of consensus as to the clinical validity of “internet addiction”, demand for, and availability of, treatment for these problems is growing. This is especially the case in China, Taiwan, and South Korea, where interventions range from “boot-camp” style programs to counselling centres and hospital-based programs (45). In the US, UK and Europe, there are also clinics specialising in psychological treatments, including CBT, family and group therapy, social skills training and addiction counselling, as well as residential rehabilitation programs (45). Online treatment services, such as Online Gamers Anonymous, many of which are based on the 12-step model, are also available. Many of these programs are adapted from substance use disorder treatments (5).

## **12.0 Future Research**

### **12.1 Limitations of studies to date**

Information on the prevalence, course, neurobiology, genetics and treatment of internet gaming disorder, and internet addiction more broadly, is inconclusive (48). Moreover, differences and similarities between internet addiction and internet gaming addiction are unclear. Whilst some studies have looked specifically at online gaming addiction, others have used the terms interchangeably. Studies are needed to identify the defining features of these conditions, obtain cross-cultural data on reliability and validity of specific diagnostic criteria, determine prevalence rates in representative epidemiological samples in countries across the globe, evaluate natural history, and examine associated biological features (9).

### **12.2 Future research**

- Ongoing work to clarify classification categories
- Qualitative and cross-cultural studies examining cross-cultural variations in phenomenology, harms and diagnostic approaches
- Large epidemiological studies, which can be used in subsequent systematic reviews, using standardised methodologies to determine prevalence
- Longitudinal studies to investigate the natural history of internet addiction and causal relationships between internet addiction and psychopathology
- Randomised clinical trials of pharmacotherapy and psychotherapy
- Neuroimaging studies to replicate previous findings
- Examination of the specific nature of online activities associated with problematic use

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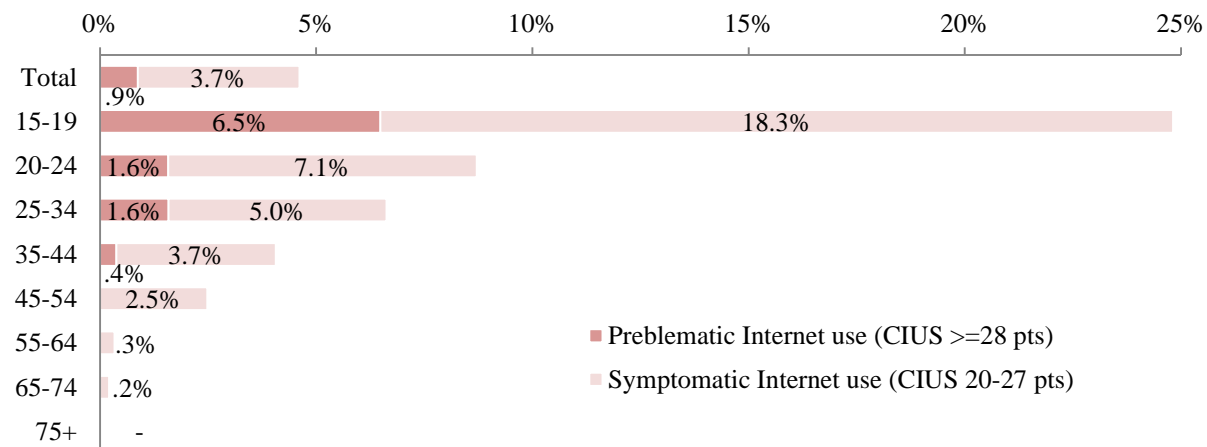
Brief summary of policy and program responses, in Switzerland, to the growing problem of excessive use of internet/smart phones/other electronic devices<sup>1</sup>

HK / 2014.08.20

### Epidemiological perspective

At Swiss level, rather little epidemiological data is available on excessive use of internet, computers, smart phones and similar electronic devices. General population data, based on the CIUS (Compulsive Internet Use Scale, Meerkerk et al., 2009), is nonetheless available from the *Addiction Monitoring in Switzerland*<sup>2</sup> (AMIS) project. Based on data collected in 2013 among the general population aged 15 years and over this survey reports figures of 0.9% for “problematic internet use” (CIUS  $\geq 28$ ) and of 3.7% for so called “symptomatic internet use” (CIUS 20-27). Figures reached 0.3% and 4.3% among men respectively, and 1.4% and 3.2% among women. These figures appear nonetheless clearly peaking among the younger age groups (**Figure 1**): “problematic internet use” (CIUS  $\geq 28$ ) reaching 6.5% among the 15-19 year age group, and was of 1.6% among 20-24 and 25-34 year age groups. Figures for “symptomatic internet use” (CIUS 20-27) were of 18.3%, 7.1% and 5.0% for these age groups.

*Figure 1: Problematic (CIUS  $\geq 28$ ) and symptomatic (CIUS 20-27) Internet use in the Swiss general population (15 year or over), by age – Data CoRoLAR, 2013<sup>3</sup>*



<sup>1</sup> Document prepared in prevision of the Meeting on public health implications of behavioral addictions associated with excessive use of internet, computers, smart phones and similar electronic devices, Tokyo, Japan, 27-29 August 2014.

<sup>2</sup> This project is running since 2011 a continuous rolling survey, so called *Continuous Rolling Survey of Addictive Behaviours and Related Risks*, which aims to cover periodically different thematic of interest. It used the CIUS during the first semester of 2013.

<sup>3</sup> Full report (in German) available at <http://www.suchtmonitoring.ch/library/pdf/104025959b153>, accessed on 2014.08.19.

## “Historical” background

It was only in 2009 that the first parliamentary requests for official investigations of potential threat and problem associated with the use of internet and online-gaming in Switzerland were submitted. These requests – two – have led to the publication, in 2012, of a first experts’ report assessing the extent of this phenomenon and describing existing responses<sup>4</sup>. In brief, this report pointed to the fact that while Internet use was becoming more widespread in Switzerland since the end of the 1990, the lack of clear criterion to address excessive use through a “clinical” perspective concurred with delays and methodological issues when aiming at assessing epidemiologically the extent of the phenomenon. The report further provided an overview of current methods of intervention to prevent and treat excessive Internet use and highlighted the relevance of considering this phenomenon based on the four-phase model of early intervention<sup>5</sup>. It further gave key focuses on strengthening media use competences and early screening and intervention initiatives, in particular among youth, and promoting treatment offer.

In response to this original report, the Federal Council published a report<sup>6</sup> underlining the shared expertise of the Federal Social Insurance Office (FSIO) and the Federal Office of Public Health (FOPH) for developing responses with regard to this growing problem. Concurrently to pointing to the need for monitoring the phenomenon more thoroughly, it expressed the need for strengthening initiatives with a focus on media use promotion and for considering intervention and treatment initiatives as part of the larger field of responses to substance use and addiction related problems.

Base on this, and on earlier initiatives aiming at empowering youth focus prevention, two core initiatives have risen under federal offices guidance.

## Current initiatives and implemented programs

Two main federal actors are currently involved in developing responses to the potential threats associated to excessive internet use and other associated phenomenon:

### *The Federal Social Insurance Office (FSIO)*

Pragmatically, the Federal Social Insurance Office has been developing for the period 2011-2015 (and thus before any parliamentary initiative), a National prevention program entitled “Youth and media”<sup>7</sup>, which is a prevention program aiming at promoting media use competences among youth<sup>8</sup>. Among core targets this program aims specifically at strengthening competencies of youth toward “new media” and prevent so called “cyber addictions”. Activities in line with media use are promoted (through guided use) by providing information on process and resources for improving competences or for getting support/help targeting youth, peer (e.g. promotion of peer media educator initiatives<sup>9</sup>), parents, and professional<sup>10</sup>; one of the underlying aim being on preventing excessive internet use, gaming, and online gaming –related problems and addiction.

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<sup>4</sup> Report available at

[http://www.bag.admin.ch/jugendprogramme/10047/13303/index.html?lang=fr&download=NHZLpZeg7t,lnp6I0NTU042I2Z6In1ae2Izn4Z2qZpnO2Yug2Z6gpJCKfHx4e2ym162epYbg2c\\_JjKbNoKSn6A--](http://www.bag.admin.ch/jugendprogramme/10047/13303/index.html?lang=fr&download=NHZLpZeg7t,lnp6I0NTU042I2Z6In1ae2Izn4Z2qZpnO2Yug2Z6gpJCKfHx4e2ym162epYbg2c_JjKbNoKSn6A--), accessed 2014.08.19.

<sup>5</sup> 1/ Promotion of an empowering environment (primary prevention and health promotion), 2/ Identification, 3/ Risk Assessment, and 4/ Intervention/treatment.

<sup>6</sup> Report available at:

[http://www.bag.admin.ch/jugendprogramme/10047/13303/index.html?lang=fr&download=NHZLpZeg7t,lnp6I0NTU042I2Z6In1ae2Izn4Z2qZpnO2Yug2Z6gpJCKfHx3fWym162epYbg2c\\_JjKbNoKSn6A--](http://www.bag.admin.ch/jugendprogramme/10047/13303/index.html?lang=fr&download=NHZLpZeg7t,lnp6I0NTU042I2Z6In1ae2Izn4Z2qZpnO2Yug2Z6gpJCKfHx3fWym162epYbg2c_JjKbNoKSn6A--), accessed on 2014.08.19.

<sup>7</sup> <http://www.jeunesetmedias.ch/fr/programme-national.html>, accessed 2014.08.19.

<sup>8</sup> This program is developed under the guidance of the FSIO, in collaboration with other Federal Offices, the Federal States and media professionals.

<sup>9</sup> <http://www.jeunesetmedias.ch/fr/programme-national/education-par-les-pairs.html>, accessed 2014.08.19.

<sup>10</sup> <http://www.jeunesetmedias.ch/fr/protection-des-jeunes.html>, accessed 2014.08.19.

### **The Federal Office of Public Health (FOPH)**

Based on the understanding that no urgent measure is presently needed on this matter at Swiss level, the Federal Office of Public Health has given primacy to the epidemiological monitoring of the phenomenon, to ensure having the potential to develop responses as soon as necessary. For this reason priority was given to measure the extent of the phenomenon through the *AMIS* project it supports, and in particular through the so called *Continuous Rolling Survey of Addictive Behaviours and Related Risks* (which is a general population survey enabling to assess periodically different issues, see above the description of “*Epidemiological facts*”). Concurrently the FOPH is currently commissioning an experts group, organized under the guidance of the two national addiction treatment professionals societies<sup>11</sup>, (a) to ensure a regular update on the state of scientific knowledge on so called - or so literally translated - “hyper-connectivity” and “cyber-addiction”, (b) to comment on the evolution of the psychosocial social and health-related care provision with this regard and (c) to determine the needs in this matter, particularly with regard to prevention and treatment.

### **Other elements to consider**

Over the years, population awareness campaign and other treatment orientation facilitating initiatives have been developed by NGOs and states medical authorities and treatment tenants: Communication work of NGOs to raise the phenomenon to the understanding of the general population were developed since the mid-2000<sup>12</sup> and expert platforms providing information on resources for treatment are available, highlighting further the importance of this phenomenon for professionals active in the addiction field<sup>13</sup>.

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<sup>11</sup> <http://www.fachverbandsucht.ch> and <http://www.grea.ch/grea>, see

[http://www.grea.ch/sites/default/files/berichtbestandesa.onlinesucht\\_v16-1.pdf](http://www.grea.ch/sites/default/files/berichtbestandesa.onlinesucht_v16-1.pdf), accessed on 2014.08.19

<sup>12</sup> E.g. <http://www.addictionsuisse.ch/faits-et-chiffres/cyberaddiction/effets-et-risques/>, accessed 2014.08.19.

<sup>13</sup> E.g. <http://www.infoset.ch/f/dependances/cyberdependance/index.cfm>, accessed 2014.08.19.





**Internet Use From a Public Health Perspective: Problems and Promise**

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**Abstract:** Over the past several decades, there have been substantial increases in the availability and use of digital technologies. The Internet has become integrated into the lives of most people, with occupational, social and recreational activities linked to Internet use. In the setting of these changes, there has been discussion and debate regarding how Internet use might be viewed from a public health perspective. In the DSM-5, a diagnostic entity entitled Internet gaming disorder (IGD) was introduced into section 3 (the section of the DSM that provides criteria for disorders warranting further study). In this manuscript, the process leading to IGD's inclusion in DSM-5 is discussed, as are current debates regarding IGD and other forms of problematic Internet use (PIU). Recommendations and future directions for studying IGD, PIU and other forms of Internet use are considered so that the use of the Internet and other digital technologies may be viewed within a public health framework.

**Key words:** Internet use, addiction, impulse control, obsessive-compulsive, digital technologies

### *Introduction*

Availability and use of digital technology and the Internet have increased considerably over the past several decades. Approximately 25 years ago, the World Wide Web was introduced by Sir Tim Berners-Lee and since that time its uses have grown and developed considerably (1). Although Internet-based communication platforms were initially utilized largely for academic purposes, the free accessibility of the World Wide Web led in the 1990s to its widespread popularization and integration into multiple domains of functioning including business, occupational, social and recreational realms. In the United States (with similar data from other parts of the world), the growth in Internet utilization is reflected in changes in households reporting access to the Internet (61.7% in 2007 versus 18.0% in 1997) and in reported usage (with 84% of Americans reporting using the Internet at least occasionally as of January, 2014) (1).

Given the increasing use and availability of the Internet and individual differences in amounts and patterns of usage, there has been debate about how best to view Internet use from a public health perspective. While the Internet provides many benefits that may promote public health with respect to provision of information, facilitation of pro-social activities and other factors, excessive or problematic Internet use (PIU) warrants consideration. PIU has arguably garnered increased attention following media accounts of deaths related to prolonged gaming activities in Internet cafes (2). Nonetheless, considerable debate remains regarding whether PIU represents a reasonable, independent diagnostic entity and, if so, how best to define it. In preparation for the 5<sup>th</sup> edition of the Diagnostic and Statistical Manual (DSM-5), PIU was considered for inclusion into the manual, and the process relating to its consideration are summarized below. Current challenges regarding PIU and theoretically related disorders are briefly reviewed and future directions for research, clinical and public health advancement are described.

### *PIU as a Diagnosis*

Multiple considerations exist as to whether PIU might be considered as a psychiatric disorder. First, it has been debated as to whether the Internet might serve merely as a vehicle for problematic behaviors (excessive gaming, gambling, pornography-viewing, shopping or other behaviors) or whether Internet use itself should be the focus of a disorder (see (3, 4)). While both views warrant consideration, similar behaviors when performed using the Internet versus those performed offline may differ significantly and have different clinical implications. For example, amongst high-school students in Connecticut, U.S.A., adolescents reporting Internet gambling (as compared to those who reported gambling but not on the Internet) were more likely to report at-risk/problematic gambling (5). Additionally, there was a stronger association amongst the Internet gamblers between at-risk/problematic gambling and poor academic performance and heavy alcohol use and a weaker association between at-risk/problematic gambling and gambling with friends (5). These findings suggest that there might exist different clinical correlates, patterns of behavior and potential risk factors relating to Internet versus non-Internet forms of gambling, with perhaps less influence of social/peer interactions relating to problematic gambling in an Internet-gambling group. Thus, regardless as to whether one might view excessive patterns of Internet use as a distinct disorder, considering the presence/absence of using the Internet to engage in specific behaviors appears important from public health and policy perspectives.

Second, the extent to which the activity of focus on the Internet (gaming, gambling, shopping) might be incorporated into a diagnosis of PIU, if one accepts the view that PIU should be considered as a standalone diagnostic entity, warrants consideration. For example, should gaming and Internet use be combined into entity when considering how to define such a disorder? The seeming combination of Internet use and gaming in the diagnostic entity of Internet gaming disorder (IGD; see DSM-5 section below) has been criticized by some as conflating two entities (Internet use and gaming) in one construct (6, 7). A survey using independent assessments of PIU and problematic video-gaming (PVG) in the same sample of high-school students found both similarities and differences between PIU and PVG, with both associated with depression and substance-use problems but each acknowledged by different proportions of the sample and showing seemingly different patterns with respect to sociodemographic features (e.g., black race associated with PVG and not PIU) and clinical features (PIU but not PVG associated with alcohol-use measures) (8, 9). Latent class analysis has also identified important differences with respect to types of Internet usage; for example, while males were found in one study to be more likely to report being more addicted to Internet use, women were more likely to report being addicted to smartphone use (10).

Studies that simultaneously assess multiple domains (gaming, pornography, shopping, social network use) support the notion of different forms of Internet addiction (11). As such, independent measures of PIU, PVG and other Internet-based behaviors may yield important insights into clinically relevant relationships.

Third, questions exist regarding the specific criteria that may be used to define PIU, the threshold used to distinguish normal and abnormal patterns of engagement, and the most appropriate classification for the disorder (12). These considerations are not entirely mutually exclusive as how best to conceptualize PIU (e.g., as an addiction, impulse-control disorder (ICD) or obsessive-compulsive-spectrum disorder (OCSD)) may guide the criteria used to define PIU. With respect to classifications, addictions, ICDs and OCSDs are not necessarily mutually exclusive, although within classification systems, like that within the DSM, they represent distinct entities (13, 14). The precise boundaries for these groupings have been debated and precise definitions have changed over time. For example, the term addiction, based on a Latin word meaning “bound to” or “enslaved by”, was initially not linked to substance-use behaviors, became associated with excessive patterns of alcohol use several centuries ago, and during the 1980s was largely considered by some experts to be defined by compulsive drug use (15, 16). However, over the past 15 years, there has been a dialog regarding the core elements of addiction (e.g., continued behavior despite adverse consequences, compulsive engagement, impaired control over participation, and a craving or appetitive urge state shortly prior to engagement in the behaviors) such that non-substance or “behavioral” addictions have been proposed (17-19) and recently incorporated into DSM-5 (14, 20, 21). Thus, the view to conceptualize PIU within an addictions framework has arguably gained greater traction over time, with some widely used screening tests (e.g., the Internet addiction test) employing items relating to addiction (22). However, the extent to which PIU might be considered as an addiction would seem to require close consideration as was given to pathological gambling (now gambling disorder) when it was reclassified from an “Impulse-control Disorder Not Elsewhere Classified” to a “Substance-related and Addictive Disorder” from DSM-IV to DSM-5 (13, 14, 23).

#### *PIU and Non-Substance Addictions in DSM-5*

Several DSM-5-related international research workgroups (including the OCSD and substance-use-disorder (SUD) workgroups) considered PIU and other possible non-substance addictions, ICDs or OCSDs with respect to their classification and definition in DSM-5 (24-28). The research workgroups systematically reviewed literature relating to gambling specifically and other conditions more broadly in order to provide background information for the DSM-5 workgroups to consider in deliberations regarding how best to address certain potentially controversial topics such as the existence of non-substance or behavioral addictions. Given the relatively greater body of research on pathological gambling and SUDs as compared to PIU that was available at the time, much of this effort focused on pathological gambling and resulted in the reclassification of gambling disorder as the sole “Non-substance-related Disorder” in the “Substance-related and Addictive Disorders” category (14). This process involved considering epidemiological, phenomenological, developmental, clinical, cultural, genetic, neurobiological and other domains with respect to similarities and differences between pathological gambling and SUDs, ICDs and OCSDs (26-28).

Despite the relative paucity of research on PIU, there was significant interest in considering PIU as a “Non-substance-related Disorder” that might join gambling disorder (29). The SUD workgroup evaluated the literature, identifying studies largely from Asia (but also from Europe and other regions) that utilized different criteria for assessing PIU or related conditions (gaming or Internet addiction, gaming or Internet use disorder, etc.). Given that the greatest amount of data available focused on gaming and particularly Internet-based gaming and related problems, the diagnostic entity that was proposed focused on Internet gaming (2). Based on the different definitions, criteria and thresholds used in different studies, findings were considerably disparate; for example, prevalence estimates often ranged from 0.1% to 10%, with some estimates exceeding 50% (2, 29). Given this situation, the SUD workgroup decided not to include PIU or a related diagnosis in the main section of the DSM-5. Instead, the workgroup crafted criteria for Internet gaming disorder (IGD) for inclusion in section 3 of the DSM, one that is used for evaluation of criteria in research settings, as well as for other research endeavors. The decision to include criteria for IGD and not a disorder focused on Internet use more broadly was based on the available literature for this type of behavior as well as for its clinical correlates (2). Furthermore, as clarified recently, the medium through

which the gaming is delivered or experienced was not intended to be central for the diagnosis (30). The decision to include the word "Internet" in IGD was made based on Internet-based gaming to be the form most likely to be linked to clinical problems and as the inclusion of the word "Internet" in IGD would help distinguish it from gambling disorder (30). In the absence of clear criteria for IGD, inclusionary criteria were selected based on similarities with those for gambling disorder and SUDs using information from commonly used assessments instruments and other available data (2). The inclusionary criteria for IGD include ones assessing aspects of pre-occupation, withdrawal, tolerance, attempts to cut back or quit, diminishing participation in non-gaming activities, continued gaming despite problems, lying to conceal the extent of gaming, gaming to escape from negative mood states and continued gaming in the setting of lost or jeopardized relationships and/or opportunities (2, 14). Although potential limitations exist with the criteria and with respect to confusion or misconceptions regarding not capturing clinically relevant gaming behaviors conducted offline and online behaviors, as well as the criteria not capturing Internet-based behaviors not linked to gaming, the criteria provide a foundation for future research that may be used to guide health initiatives and interventions related to Internet use (2).

#### *Current Status of the Field, Recommendations and Future Directions*

Research into IGD and other possibly related diagnoses like PIU is at a very early stage and is arguably several decades behind research into gambling disorder (which itself has lagged behind research into SUDs and many other psychiatric disorders). Furthermore, the uses for digital technologies continue to increase, as do their availability and social acceptance. As such, clinicians, researchers, policy makers and others are considering IGD, PIU and other theoretically related conditions within a changing environment. Superimposed upon this changing environment is populations of varying ages that have had digital technologies introduced at different stages of development. Thus, in looking towards the future, one might predict that as the younger individuals who have had digital technologies introduced early in development (thus potentially leading to greater ease, comfort, and facile usage) mature, the possible benefits and pitfalls of Internet use may differ from those encountered presently. As such, collecting information while being mindful of dynamic influences will be important in public health considerations.

As noted by members of the DSM-5 SUD workgroup (2, 14) and others (31, 32), there is a paucity of research on Internet-use behaviors and disorders, and the interpretation of the findings is complicated by the use of disparate scales with differential thresholds. This situation has complicated the estimation of prevalence estimates, calculation of impact on individual and public health, study of effective/efficacious prevention, treatment and policy interventions, and identification of etiological and risk factors. As such there is a need to define and utilize consistent criteria across geographic locations and cultures. Towards this goal, a recent international expert group generated a consensus article for utilizing the DSM-5 criteria across multiple regions of the world (2). The widespread utilization of the criteria of IGD has the potential to provide important insights into the prevalence of IGD and the extent to which the criteria individually and as a whole operate well. Additionally, the criteria will facilitate investigations into valid and reliable assessment and screening instruments that may be used cross-sectionally and longitudinally. These instruments could facilitate investigations into the etiological factors (genetic, environmental) that might lead to and/or influence the development and progression of, as well as the remission from, IGD. By collecting information on the timing of the appearance of specific criteria, information about criteria duration may be considered from diagnostic and clinical perspectives. Such information would be helpful not only in refining diagnostic criteria, but also in refining the instruments that might be relevant in clinical research endeavors, including randomized clinical trials (and few such trials have been conducted to date (33-35)). Additionally, collecting ancillary information (e.g., quantity/frequency measures of gaming, types of games played, co-occurring disorders, measures of health and well-being, among others) will help to understand the nature of IGD and how best to help people who may be at risk for developing IGD or those who may be experiencing IGD.

Although the proposed framework for studying IGD internationally provides guidelines for moving IGD research forward in a significant and timely manner (2), there exist additional considerations that warrant attention. For example, while IGD focuses on gaming, a wider range of Internet-based activities may be problematic for individuals. Collecting information on types and patterns of Internet use that are not linked specifically to gaming (e.g., pornography viewing, gambling, shopping) will also be important with respect to considering

how to identify individuals with Internet-related problems (36-38). A consensus on possible criteria for problematic engagement in such behaviors would help with respect to understanding the public health impact of such behaviors and with developing instruments to identify individuals who might be at risk for developing or have such disorders. How digital technologies are used should be considered from non-diagnostic perspectives as some usage may be particularly risky (e.g., texting while driving, cyberbullying, sexting) and some may be particularly helpful (e.g., ecological momentary assessment, smartphone-based clinical interventions, computer-delivered behavioral therapies) from mental health perspectives (39-43). Considering both the benefits and problems that digital technologies might provide will be important in assessing and promoting public health.

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**Internet and Smart Phone Addiction: Public Health Implications in Indian Context**

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Internet is a neutral device to facilitate research, communication and e-commerce

Advantages-

- Anonymity
- Convenience (24/7)
- Governance
- Other issues-gender difference, triggers, can be maladaptive
- Use/Abuse for Cyber sex, cyber-relation, net compulsion, information overload and gaming

According to Global Internet Report 2014, globally there are about 2.9 billion internet users and about 56% of mobile phones users are Smart Phone users. Currently internet penetration in India is around 15% (243 million users) and about 10% are smart phone users (117 million). In spite of relatively low penetration, India has the third largest internet user base in Asia and fourth largest in the world.

It has been projected that India will have 519 million mobile internet users by the year 2018. Youth constitutes almost 80% of internet users in the country.

#### **Why is it a concern?**

Over the past two decades Internet Addiction (also known as Problem Internet Use- PIU) has attracted attention of academics and researchers. Public health implications of Internet Addiction have been recognized increasingly by policy makers and other stakeholders over the last decade.

Internet Addiction is characterized by a psychological dependence on the internet. It manifests as an increasing investment of resources on internet-related activities; unpleasant feelings (e.g., anxiety, depression, dysphoria and emptiness) when offline; an increasing tolerance to the effects of being online; and denial of the problematic behaviour. This interferes with or impairs normal functioning. Additionally it tends to be associated with emotional distress for the individual, their family, friends, or significant others.

Need to include Internet Addiction in nosological systems have been expressed in scientific literature including editorial in leading psychiatry journals (Block 2008). Recently, Internet Addiction has been included in the latest revision of Diagnostic and Statistical Manual of Mental Disorders i.e. DSM-5 under Section III.

#### **Public Health Implications of Internet Addiction**

Conceptualized as an impulsive- compulsive spectrum disorder by some, it has been found to share many commonalities with the addictive disorders. Conditioning processes have been found to play a key role in development of both Internet Addiction and addiction to psychoactive substances. Individuals diagnosed with Internet Addiction have been found to have deficits in performance on various neuropsychological tasks. These include decision-making deficits, reductions in prefrontal control and other executive functioning, and inability to inhibit responses to certain stimuli. Similar deficits have been observed among individuals with dependence on psychoactive substances. Functional neuroimaging studies among individuals with Internet Addiction have also suggested findings similar to that observed among individuals with psychoactive substance use disorders (Brand, Young et al. 2014).

Internet Addiction has been postulated to represent a chronic disorder with remissions and recurrences (Ko, Yen et al. 2007). It is associated with poor psychological well-being, reduced work performance, social withdrawal, poor self-confidence, family problems, marital breakdown, poor diet, sleep deprivation and cardiopulmonary-related death (Christakis 2010; Flisher 2010). Other adverse consequences associated with Internet Addiction include negative academic consequences

Public health relevance of systematic research into Internet Addiction has been acknowledged in the most recent revisions of Diagnostic and Statistical Manual of Mental Disorders i.e. DSM-5. DSM-5 states that Internet Addiction has public health importance and additional research may pave way for its inclusion as an independent diagnostic category in nosological systems.

#### **Relevance of Addressing Internet Addiction in Indian Context-Literature from India**

In one Indian study, **5% of youth** (n=275, males) in the age group 18-25 years had addictive use of social networking sites and **24%** (n=350-200 females and 150 males) had problematic usage of internet (Menon & Sharma 2013; Barathkar & Sharma 2011-personal communication). In another study sponsored by the Indian Council of Medical research (Sharma, Benegal, Rao & Thennarasu, 2013-personal communication) among 2755 subjects in the age group of 18 to 65 years (50.5% males & 49.5% females) revealed that **addictive use was present among 1.3%** (2% males & 0.6% females) **for internet**; 4.1 % (5% males & 3.1% females) for mobile phones ; 3.5% for social networking sites ; Shopping ( 4%, male-3.2% & female-4.8%); Sex/online pornography (0.2%- 0.3% male&0.1% female) and 1.2% (offline & online) had gambling addiction. Statistically significant differences were observed in relation to family status for internet and face book addictions. It was more among singles, unmarried and lesser in joint families. The number of years of marriage has negative correlation with shopping, sex, mobile, internet and facebook addiction. Physical (eye

strain)/Psychological distress (decrease sleep, irritability and restlessness) was present as a morbidity- 6.8% with mobile phone addiction; 4.2 % with internet use and 3% with social networking sites , 3.3% wanted to change their internet activities and 4.2% wanted cut down expenses on mobile phone.

### Other studies

#### School students

Other than the two studies quoted above there is limited literature on Internet Addiction form India. A cross sectional study compared **18 internet dependent school goers aged between 16-18 years** with 21 non-dependent school goers in same age group. The findings revealed that internet dependent adolescents delayed their work to spend time online, lost sleep due to late-night logons, and felt 'life would be boring without the internet'. The hours spent on the internet by dependent users were greater than those of the non-dependent users. Those dependent on internet scored higher than the non-dependent on the loneliness measures (Nalwa and Preet 2003). Another study among 621 students from class 11th and 12th found 12% of the students to be dependent on internet (Yadav, Banwari et al. 2013). Internet Addiction was predicted by time spent online, usage of social networking sites and chat rooms, and also by presence of anxiety and stress

#### College students

A cross-sectional survey carried out in **3 different colleges in the city of Mumbai covered** about 1000 college students (aged 16-18 years) having access to the internet over past 6 months (Goel, Subramanyam et al. 2013). The authors reported that among the study subjects 74.5% were moderate users, **24.8% were possible addicts, and 0.7% was addicts**. Males in comparison to females were significantly more likely to be addicted.

#### Medical students

A limited number of studies have explored Internet Addiction among medical students globally. Two studies on this theme have been published from India so far. One study among undergraduate medical students reported rate of Internet Addiction to be **9.5%**. The rate was almost double among male students as compared to females (Malviya, Dixit , 2014). Another study among undergraduate medical students reported the prevalence of Internet Addiction (moderate and severe) to be 18.9%. Interestingly, 57.8% of the students were identified as cases of mild Internet Addiction (VidyaMavila, Bhagyalakshmi, 2013). Another publication from the same group among first year medical undergraduate students reported a significantly positive correlation between Internet Addiction test scores and the negative affect scores (assessed using Positive and Negative Affect Schedule). A positive correlation was also found between the daily duration of internet use and negative affect scores (VidyaMavila, Kodavanji, 2014).

A recent unpublished work has made comparison of rates of problem internet use (PIU) among undergraduate medical students across three countries including India, Croatia and Nigeria (Balhara, Gupta et al.). The final analysis included **842 subjects**. The study shows a high prevalence of PIU symptoms among the study participants with almost half of the study subjects scoring higher than the cut-off score on the study instrument. Only a small fraction (**0.5%**) had score indicating severe degree of problem. Being male and spending greater amount of time on internet are possible predictors of PIU. Participants scoring more than the cut off score on the rating scale also had a significantly higher proportion of use for browsing purposes, for social networking purposes, for chatting purposes, for gaming purposes, for shopping purposes and for pornography viewing. However, use of internet for email and academics purposes does not vary between those with and without PIU. In spite of being cross-national in nature this study is limited by recruitment of subjects from one site each from the three countries. There is a need to expand this work at a larger scale and across more settings.

#### Professionals with access to internet

A study among 273 professionals with access to internet reported the prevalence of Internet Addiction (Grover, Chakraborty et al. 2010). This study explored fulfilment of criteria for dependence as specified in ICD-10. Most common criteria fulfilled by the study subjects were persistence with internet use despite harm (55%). This was followed by craving (54%); preoccupation with use (51%); loss of control (49%); withdrawal (20%); and tolerance (14%). fifty two percent of the respondents met at least three criteria for dependence a specified in ICD-10.

#### Lacunae in existing literature

There is limited research on Internet Addiction globally. This is especially true for Low and Middle Income (LAMI) countries including India. DSM-5 has acknowledged the lack of literature, especially systematically planned studies, on Internet Addiction across different countries. In spite of limited

literature the condition warranted an inclusion in Section of III of the latest revision under 'conditions for further study'.

The earlier literature in support of Internet Addiction has been criticized for lacking correlation and explanatory studies and analyses. Many of these studies failed to take into account pre-existing or existing mental disorders or difficulties, health problems or disabilities (Hinic 2011). Some of the existing studies have been critiqued for small sample and sampling method (Widyanto and Griffiths 2006). Additionally, many of these studies did not explore the reason for internet use and nature of interactions over internet (Jackson, von Eye et al. 2004). Finally, most of the studies on Internet Addiction have been conducted at a single site. Only some have explored it at more than one site, albeit with-in the same country. Cross national comparisons of prevalence of Internet Addiction have not been carried out. Use of varied methodology including different study questionnaires makes cross-national comparisons across different studies difficult.

Finally, lack of well planned controlled trials undermines the possibility to make informed evidence based choice while offering intervention to those diagnosed with Internet Addiction.

#### **Experiences at the NIMHANS Clinic**

**Profile of cases:** The Clinic sees about 2-3 users per week (video gaming, mobile texting, social networking sites and pornography) in the age group of 14-19 years, middle to upper socioeconomic status, predominately male, do online activities on their smart phone or at home computer or cyber café, indulge in stealing to maintain cyber use, low to absence of knowledge of cyber laws; want to have brief intervention or prefer brief contact; received 3-4 mails per week from other states of India (esp from the parents for their teenagers)- enquiring about the service as well as possibility of online help or telephone counselling. Clinic also gets 1-2 cases (in the age group of 6-20 years) per week from the Psychiatry Units for management of excessive of information technology. The reasons for seeking help were loss of academic grade; changes in teenager's behaviour in the form of irritability/anger outburst consequent to restriction in usage of technology; avoiding family contact, preferred to be on information technology devices and indulgence in high risk behaviours due to online pornography.

#### **The way forward**

India is home to 17% of world's population. Growing urbanization and increased access to internet in the rural and remote areas of the country means that an increasingly larger proportion of Indian population is being exposed to internet and put them at potential risk of problems associated with internet use. There has been a 25% increase in internet penetration in India over past five years. The classical 'Host-Environment-Agent' model of disease causation will suggest that this increased penetration of agent is likely to put an increased number of hosts at risk of problems (including Internet Addiction) associated with it. Moreover, internet comes with a plethora of benefits and elimination (or even control) of agent does not seem to be a viable option. Hence, in spite of Internet Addiction sharing its underpinning with other addictions, its management is going to be even more challenging. Consequently it is imperative to develop a comprehensive and balanced strategy to address this issue.

Having a clear understanding in the extent of problem and behavioural and environmental concomitants of Internet Addiction is essential to achieve this. Having a systematic review of the exiting literature on Internet Addiction is likely to improve our understanding in the lacunae in existing literature. Systematic and well planned studies (using quantitative as well as qualitative methodology) among the population-at-risk will help generate this missing information in a scientific manner. There is a need to identify the subcategories of this disorder (viz. generalized disorder, disorder of online social interaction, online gaming, etc.) and describe them clearly. There is also a need to unify the experiences in diagnosing different forms of Internet Addiction. This will involve identifying the most efficient of these to be included in clinical interview. In order to ensure reliable objective assessment, there is need to develop screening and rating scales with improved psychometric properties. Finally, there is a need to conduct well planned controlled clinical trials to assess effectiveness of proposed interventions.

**Suggested reading**

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## Internet addiction: Diagnostic approaches and epidemiology

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### I. Diagnostic Approaches for Internet Addiction

**Background:** To date, no generally accepted diagnostic approach for Internet Addiction exists. Different concepts have been described. Paralleling the diversity of concepts, assessment instruments differ as well and a consensus is lacking. For Internet Gaming Disorder (IGD), DSM-5 has made a proposal covering 9 criteria. However these are restricted to gaming and have not yet been applied to other Internet activities.

**Methods:** Participants of a general population sample (N=15,023) reporting to use the Internet for private purposes for at least one hour at a typical day of the week or at weekend and scoring 21 or higher on the Compulsive Internet Use Scale (CIUS) were approached for a comprehensive personal interview. The final sample consisted of 196 individuals with 82 meeting the diagnostic threshold of more than 5 criteria among which 30 specified Computer Games, 30 Social Networks, and 22 others as main activities when using the Internet. Comorbidity was assessed using the Munich Composite International Diagnostic Interview (M-CIDI), the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II), and the Conners Adult ADHD Rating Scale (CAARS). Impulsiveness was assessed with the BIS-11 – Barratt Impulsiveness Scale.

**Results:** DSM-5 criteria showed no clear difference between groups [1]. No significant differences were found between the studied subgroups for substance use, mood or anxiety disorders as well as for the total number of personality disorders and the ADHD measure. Only few differences were observed with respect to impulsiveness and just 2 of 21 impairment variables differed between groups.

**Conclusions:** More commonalities than differences were observed when comparing Internet dependent individuals based on adapted DSM-5 criteria with respect to mainly using Computer Games, Social Networks or other activities. This speaks in favour of the DSM-5 criteria to be used for Internet Addiction in general.

1 Rumpf HJ, Bischof G, Bischof A, Besser B, Glorius S, deBrito S, Rehbein F, Mößle T, Gürtler D, John U, Meyer C, Petry NM: Applying dsm-5 criteria for internet gaming disorder to different internet activities. Manuscript Draft 2014:University of Lübeck, Germany.

### II. Epidemiology of Internet Addiction and comorbidities

**Background:** Studies on the epidemiology of Internet addiction suffer from a number of weaknesses including different diagnostic approaches, various assessment instruments and diagnostic thresholds. Furthermore, populations under study have mostly not been representative. Sample selection bias is very likely to be a major cause of divergent prevalence estimates. Quite a number of prevalence estimations are based on convenience samples and only very few on general population studies.

**Methods:** In the absence of a consensus concerning criteria to define and tools to assess Internet Addiction, a statistical approach by performing a latent class analysis was used. A telephone survey was conducted based on a random digit dialling procedure including landline telephone (n=14,022) and cell phone numbers (n=1,001) in the German general population aged 14 to 64. The Compulsive Internet Use Scale (CIUS) served as the basis for a LCA used to look for subgroups representing participants with Internet addiction or at-risk use. CIUS was given to participants reporting to use the Internet for private purposes at least one hour at a typical day of the week or at least one hour at a day at weekend (n=8.130). A follow-up interview was conducted with a subgroup of the sample with excessive Internet use. CIDI und SKID 2 were used to assess comorbidities.

**Results:** A six-class-model showed best model fit and included two groups likely to represent Internet addiction and at-risk Internet use [1]. Both groups showed less social participation and the Internet addiction group less general trust in other people. Proportions of probable Internet addiction were 1.0% (CI: 0.9-1.2) among the entire sample, 2.4% (CI: 1.9-3.1) in the age group 14 to 24, and 4.0% (CI: 2.7-5.7) in the age group 14 to 16. No difference in estimated proportions between males and females was found. Unemployment (OR=3.13; CI: 1.74-5.65) and migration background (OR=3.04; CI: 2.12-4.36) were related to Internet addiction. In the follow up sample, those who fulfilled at least 5 DSM-5 criteria for Internet Gaming Disorder and who reported that gaming was their main activity in the Internet, high proportions of comorbid disorders were found: Substance Dependence 46.7%, Mood Disorders 46.7%, Anxiety Disorders 23.3%, Cluster A personality disorder 4.%, Cluster B personality disorder 12.0%, Cluster C personality disorder 24.0. Findings were comparable for other Internet activities showing that between 28% and 33% (depending on main activity) had at least one personality disorder.

**Conclusions:** This LCA-based study differentiated groups likely to have Internet addiction and at-risk use in the general population and provides characteristics to further define this rather new disorder. Comorbidity was found to be high.

1 Rumpf HJ, Vermulst AA, Bischof A, Kastirke N, Gürtler N, Bischof G, Meerkerk GJ, John U, Meyer C: Occurrence of internet addiction in a general population sample: A latent class analysis. European Addiction Research 2014;20:159-166.

## **Substance Dependence and Addiction in ICD 11**

### **A discussion paper**

**Prepared by John B. Saunders, Sydney, Australia**

Clinical, psychological, neurobiological and epidemiological evidence points towards the existence of a central syndrome of substance dependence, an entity which is synonymous with the older term “addiction” in its essentials. This central syndrome is acquired as a result of prior repetitive use of a psychoactive substance with dependence-inducing or addictive properties. There are many influences – social, psychological and individual – which affect its development, but repetitive substance use is the fundamental mechanism. The characteristic feature of a substance dependence syndrome or addiction is an “**internal driving force to use**” (a psychoactive substance or a technology).

### **Origins of the syndrome**

The origins of the clinical syndrome of substance dependence, which is arguably the central diagnosis in the substance use field, lie in the work of Edwards and Gross (1976), who, on the basis of detailed clinical observations, described a clinical syndrome of alcohol dependence. This description formed the basis, with modifications, of substance dependence in DSM-III-R, which was published in 1987, ICD 10, published in 1992 and DSM-IV published in 1994. The initial data which support the existence of a dependence syndrome are much older, with research defining the characteristic symptoms, problems and experiences of opioid and alcohol dependence beginning in the 1930s and 1950s-60s respectively.

### **General applicability to psychoactive substances**

The central concept of a substance dependence syndrome has been found applicable to a wide range of psychoactive substances including alcohol, nicotine (tobacco), prescribed medications such as benzodiazepines, and a variety of drugs which are used (typically illegally) for their euphoric effects or broadly recreational purposes. These include cannabis (marijuana), psychostimulants such as methamphetamine and cocaine, illicit opioids such as heroin. There are several hundred other agents some naturally occurring, some manufactured, which demonstrate dependence-inducing properties, although there is not yet a body of research to indicate whether the full syndrome exist. These substances include gamma hydroxybutyric acid (GHB), betel nut, synthetic stimulants and cannabinoids and cathinones.

### **Central features of dependence**

Substance dependence in ICD 10 is described as a cluster of cognitive behavioural and physiological features which include the following:

- A strong desire or sense of compulsion to take the substance;
- Difficulties in controlling substance-taking behavior in terms of its onset, termination, or levels of use;
- A physiological withdrawal state when substance use has ceased or have been reduced, as evidenced by: the characteristic withdrawal syndrome for the substance; or use of the same (or closely related) substance with the intention of relieving or avoiding withdrawal symptoms;
- Evidence of tolerance, such that increased doses of the psychoactive substance are required in order to achieve effects originally produced by lower doses (clear examples of this are found in alcohol- and opiate-dependent individuals who may take daily doses sufficient to incapacitate or kill non-tolerant users);
- Progressive neglect of alternative pleasures or interests because of psychoactive substance use, increased amount of time necessary to obtain or take the substance or to recover from its effects;
- Persisting with substance use despite clear evidence of overtly harmful consequences, such as harm to the liver through excessive drinking, depressive mood states consequent to

periods of heavy substance use, or drug-related impairment of cognitive functioning; efforts should be made to determine that the user was actually, or could be expected to be, aware of the nature and extent of the harm.

The criteria in DSM-IV are rather similar with the main exception that there are seven (rather than six) and the ICD 10 criterion, "craving", is omitted (See Table 1)

### **Applicability for gambling, Internet and related addictions**

In recent years the concept of addiction has been applied to disorders where there is intensely repetitive activity, which tends to progress over time. These include pathological gambling, pornography, video/DVD games, Internet-based single-player and multi-player games, various social media, smart phone applications (apps) and similar electronic devices. Gambling addiction, though termed "disordered gambling" has been accepted as a diagnosis in DSM-5, published in 2013. The diagnostic criteria differ and comprise and following listed in Table 2.

According to DSM-5 criteria for gambling addiction, the person must display the following:

- A. Persistent and recurrent problematic gambling behavior leading to clinically significant impairment or distress, as indicated by the individual exhibiting four (or more) of the following in a 12-month period:
  1. Needs to gamble with increasing amounts of money in order to achieve the desired excitement.
  2. Is restless or irritable when attempting to cut down or stop gambling.
  3. Has made repeated unsuccessful efforts to control, cut back, or stop gambling.
  4. Is often preoccupied with gambling (e.g., having persistent thoughts of reliving past gambling experiences, handicapping or planning the next venture, thinking of ways to get money with which to gamble).
  5. Often gambles when feeling distressed (e.g., helpless, guilty, anxious, depressed).
  6. After losing money gambling, often returns another day to get even ("chasing" one's losses).
  7. Lies to conceal the extent of involvement with gambling.
  8. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of gambling.
  9. Relies on others to provide money to relieve desperate financial situations caused by gambling.
- B. The gambling behavior is not better explained by a manic episode.

### **The upsurge of Internet-type addictions**

There has been an explosion of disorders and problems related to the excessive use of the internet, smart phones and similar electronic activities in recent years. This has been particularly evident in many countries in Asia and in several represents the major workload of community and clinical addictions services. In Western countries electronic addictions are becoming increasingly common and in this case are typically added to a repertoire of psychoactive substance use among young people in these countries. There are no existing diagnostic guidelines (criteria) in the draft ICD 11 material, but this is currently being addressed, and potential

### **Determining diagnostic entities in the Addictive Disorders**

Although it might seem simple to define diagnostic entities on the basis of the common features, it is more challenging than this. There are important considerations of the purpose of the diagnostic system, the predominate audience, which populations to prioritise for data generation, the needs of students and trainees as well as health practitioners, applicability and precision for research, ease of learning the guidelines, and communication to fellow practitioners, and patients and their families.

### **Source of the data**

Confusion has arisen when diagnoses which were developed from clinical samples are applied to samples drawn from the general populations. A good example, partly because of the wealth of

available research, is alcohol dependence. Alcohol dependence was originally described as a tightly clustered and fairly severe disorder where a series of features tended to occur in the same person (consuming excessive alcohol) at the same time. These features included impaired control over alcohol consumption, drinking alcohol being a central feature of the person's life, and a range of physiological disturbances. Its course over years varied markedly from person to person and broadly fell into two categories (i) those who abstained from alcohol (for all or much of the time) and who recovered physical, psychological and social functioning, completely or for much of the time, and (ii) those who continued to drink alcohol and demonstrated continuation of the clinical syndrome and often a progressive, downhill course leading to death from an alcohol-related disease. Few were able to resume any form of moderate or controlled drinking, although there has been considerable debate about this, often related to measurement tools.

In community samples alcohol dependence appears to be quite a different entity and the question is whether it is the same disorder as is seen in clinical settings. From data which indicate that alcohol dependence waxes and wanes and essentially shows a plasticity which is not observed in the clinical syndrome, this seems unlikely. Partly this can be explained by differences in severity between the average person identified as having alcohol dependence in the general population and the average person diagnosed in the clinical setting. There are substantial differences in the severity and the number of features of dependence typically exhibited in these two populations. Furthermore the course of people diagnosed with clinical alcohol dependence (and having experience of treatment) is radically different from those identified in the community who have no experience of treatment.

A key question for ICD 11 is the source of the data and this relates closely to the central purpose and the predominant audience of the ICD system. For a system and a diagnostic manual which is orientated to clinical practice, it can be argued that the experience of the disorder in clinical samples is the most relevant.

### **What is the principal audience?**

This is a key consideration. It is not possible for a single diagnosis and classification system to be equally suitable for its various audiences and the groups who will be employing it. Choices have to be made as to which are the priority groups. Here are some.

- Clinicians
- Researchers
- Teachers
- Students and trainees
- Medical records clerks
- Epidemiologists
- Health statisticians

### **The need for effective communication**

A further key consideration is that diagnostic entities should be simple enough for effective communication (for example, between health professionals, with patients and families and with relevant lay persons). The clustered syndromal disorder of substance dependence and can be easily summarised for the purposes of communication. Likewise, the biological and psychological data supporting it can be related to its key features.

Substance dependence is an **"internal driving force to use"** a psychoactive substance. It is therefore a **disorder of regulation** of substance use in which internal drives and cues increasingly overwhelm external influences including social and environmental ones. The notion of dependence or addiction being an internal driving force to use a substance is an easy one for patients, practitioners and students to understand.

### **Components of the dependence syndrome**

The broad constellation of symptoms, problems and experiences that occur in people with a substance dependence syndrome can be conveniently summarised, in several ways. One is according to the cognitive, behavioural and physiological dimensions. Thus the dependence syndrome can be dissected into:

- (1) internal experiences such as craving;
- (2) observable behaviours such as impaired control over substance use, and substance use having a priority over other responsibilities;
- (3) increase in tolerance; and
- (4) occurrence of withdrawal symptoms on cessation or reduction in use.

These features can also be related to the known mechanisms be these psychological or neurobiological. For example:

- (1) Disturbance in the reward system resulting from repetitive substance use results in the development of tolerance and also reduction in the effect of natural rewarding activities. These changes can lead to an anhedonic and low motivational state.
- (2) Increase in the excitatory brain systems which subserve alertness. Normally a balance exists between the activity of the excitatory neurocircuits (largely subserved by glutamate) and the sedating or anti-stress ones (largely subserved by GABA). This makes the person particularly sensitive to triggering by stimuli (such as sites, sounds and taste) associated with the particular substance.
- (3) Disturbance in the salience neurocircuitry whereby the normal priorities of human beings (survival, care of oneself and others) are subverted so that the substance is accorded a higher priority in the person's life and other activities and responsibilities are shifted to the periphery.
- (4) Inhibition of the behavioural control pathways which attempt to regulate the activity of the reward excitatory systems. These pathways become progressively impaired as substance use continues.

The resulting effects of these changes are the unfettered and unchanged persistent use of a psychoactive substance. In contrast to the repetitive use in the early phases, which is influenced or determined by external circumstances and also by internal negative feelings, the use of a substance is increasingly driven by internal forces of urge and need.

### **Selection of diagnostic guidelines (criteria)**

From the multitude of experiences of persons with addiction diagnostic guidelines or criteria need to be selected for the purposes of succinct description and communication and to form the basis of diagnosis in clinical practice. Diagnostic criteria are selected on the basis of:

- (1) They are representative of the common and key experiences of the person with a dependence syndrome.
- (2) They can be easily conceptualised and convey the essence of major features.
- (3) That they do not represent features which are nebulous or difficult to encapsulate.
- (4) They are relatively common (rarely-experienced criteria are not practically useful even though they may be pathognomonic).
- (5) That they are of a nature that allows questions to be constructed which tap into various aspects of that central feature.

It should not be expected that diagnostic guidelines or criteria should capture all the features of dependence. Some features are more difficult than others. For example tolerance is more difficult to operationalise than impaired control or withdrawal symptoms. Craving, although a characteristic feature of dependence, was considered to be a too subjective an experience to be included in DSM-IV, although it was included in DSM-5 (in part to facilitate harmonisation with ICD 10 and potentially ICD 11).

It should also be noted that criteria may therefore not represent the totality of the features of a particular syndrome; rather they are the most easily measured or expressed ones. Some experiences can be identified through direct questions; some are gleaned from the person describing their daily life in a narrative way. Some symptoms and experiences can be ascertained in a single interview, for others assessment over time is necessary. Clearly, criteria which are best assessed longitudinally will be less suitable than those which can be elicited in a single interview based on current and historical information.

## Developing draft guidelines (criteria) for ICD 11

In the early stages and during the first meeting of the ICD 11 Substance Use Disorders Working Group, there was evidence presented and discussions about the most important and characteristic features of the substance dependence syndrome, with the conclusion that impaired control over substance use was the most important one, another central feature particularly evident over time is the change in priorities in the person's life, with substance use ascending the priority list (i.e. becoming more salient to that person). It was also recognised that the existence of withdrawal phenomena, although not universal, was an important cause of psychological and physical distress and was intimately bound with the neurobiological processes of dependence.

Accordingly a proposal was made to explore a reduced number of diagnostic guidelines (this term is used in ICD rather than criteria) for the purposes of simplifying understanding of the dependence syndrome and focusing on the most central features. Therefore the following clinical description of substance dependence was prepared.

“Substance dependence is a chronic disorder of regulation of psychoactive substance use which arises from repeated or continuous use of that substance. Its central feature is a strong **internal drive to use the substance**, which is manifested by impaired ability to control use, increasing priority given to use over other activities, the development of tolerance and often withdrawal symptoms and/or continuing substance use despite adverse consequences.”

The following diagnostic guidelines were also prepared:

- The key characteristic of Substance Dependence is a repeated or persistent pattern of psychoactive substance use where there is evidence of an **internal psycho-physiological drive** to use that substance.
  - The diagnosis requires two or more of the three central features to be present in the individual at the same time and to occur repeatedly over a period of at least 12 months or continuously over a period of at least one month.
  - The central features are:
    - **Impaired control** over the onset, level, circumstances or termination of use of a psychoactive substance, often accompanied by a subjective sense of urge or craving to use the substance.
    - Substance use becomes **a priority in life** such that it takes precedence over other interests or enjoyments, daily activities, responsibilities or health or personal care, and takes an increasingly central role in the person's life.
    - **Physiological features** (indicative of neuro-adaptation to the substance) as manifested by (i) **tolerance**, (ii) **withdrawal symptoms** following cessation or reduction in substance use, or (iii) repeated use of the substance (or pharmacologically similar substance) to **prevent or alleviate withdrawal** symptoms. Withdrawal symptoms must be characteristic for the withdrawal syndrome for that substance and must not simply reflect a hangover effect.
  - Physical and mental harm typically occurs in persons with Substance Dependence but they are not essential for the diagnosis.
- (1) In this formulation, the first guideline for the diagnosis of dependence is therefore **impaired control over use**. This is commonly associated with a strong desire or craving to use (the cognitive component), but this is variably applicable to different psychoactive substances, was omitted from DSM-IV and was not considered to be such a central feature as impaired control.
  - (2) The next central guideline was evidenced in the shift of priorities towards substance use being a central feature of daily life. This is a reflection of the driving force of dependence which has the effect of squeezing out other responsibilities, priorities and activities. It is a phenomenon which is seen very characteristically in electronic and other behavioural addictions.
  - (3) There remain the physiological accompaniments of the dependence syndrome. These are integral to the entire experience of dependence and cannot be divorced from the other two major guidelines. They include an increased tolerance to the substance so that more is



required to achieve the desired effect, and also various withdrawal phenomena, the latter include (i) the occurrence of a characteristic withdrawal syndrome upon cessation or reduction in substance use, and which tends to be the opposite of the acute pharmacological effects of the substance, (ii) Relief of withdrawal symptoms through consumption of more of the substance before the withdrawal syndrome has fully developed and (iii) prevention of the occurrence of withdrawal symptoms by constantly consuming the substance (“topping up”), in the knowledge that otherwise a withdrawal syndrome is likely to ensue.

### **Relationship of the reduced number of diagnostic guidelines (criteria) to ICD 10 diagnostic guidelines**

The first guideline reflects impaired control and incorporates the experience of craving. The latter supports the presence of the criterion but is not sufficient in itself for the criterion to be fulfilled. For that there must be evidence of impairment control abuse, in terms of its onset, duration, amount used, ease of cessation and contextual appropriateness.

The second criterion of prioritisation of the substance is represented in ICD 10 by the salience item and also the last criterion continued use despite harm, which reflects the greater priority of substance use over self-care and physical and other symptoms.

The third guideline is represented in ICD 10 by tolerance and the composite withdrawal criterion.

### **Relevance to Internet and Related Addictions**

Internet and related addictions are disorders which arise from the excessive use and pre-occupation with the use of electronic media as typically accessed through the Internet and including games, social media and pornography. The term was first used in the late 1990s and it has become of increasing concern over the past decade. The characteristic features are the excessive use (in terms of hours of the day) of Internet-type activities, which may increase as time goes by to 14-16 hours or more per day. Such use typically intrudes into normal activities of eating, social contact, discharging responsibilities to study, work, contributing to the household and personal and civic tasks. Often the excessive time is spent in the night-time, particularly when international groups of Internet users are involved, with very different time zones. Commonly academic results of school and college students decline and work is compromised because of day-time sleepiness or unreliability.

Withdrawal phenomena would seem to exist, although these are expressed typically as anger when there is an interruption to Internet use. Indeed violent acts towards parents are well described when Internet access is denied or interrupted.

A characteristic feature of excessive use of Internet is the emersion of that person in the activity to the extent that they appear to enter a separate world either individually or with other players in the Internet game. This is a very characteristic feature of multiplayer Internet games and is analogous to the “zoning out” seen in many people addicted to gambling if the continue gambling for 14-16 hours a day or more. A characteristic feature of Internet gaming is that the person develops a second identity, known as an avatar, and that for some the avatar may seem a more real existence than their actual life.

A feature of Internet gaming is the sense of status achieved from being a member of a successful team or guild. Status can also be achieved in single player games through the accumulation of virtual money, jewels or other valuables, points, or other status markers.

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**Table 1**  
 Diagnostic Criteria for Dependence/Alcohol Use Disorder /Substance Use Disorder in  
 ICD 10, DSM-IV and DSM 5

	ICD-10–Dependence	DSM-IV Dependence	DSM-5 Alcohol Use Disorder / Substance Use Disorder(s)
Stems		A maladaptive pattern of substance use, leading to clinically significant impairment or distress, as manifested by 3 or more of the following, occurring at any time in the same 12-month period:	A problematic pattern of alcohol (or other substance) use leading to clinically significant impairment or distress, as manifested by at least two of the following, occurring within a 12-month period:
1§ New in DSM-5c	A strong desire or sense of compulsion to take the psychoactive substance (craving or compulsion) a	No equivalent criterion – mentioned in text	Craving, or a strong desire or urge to use alcohol (or other substance) a
2a	No equivalent criterion, but text states that the subjective awareness of compulsion is most commonly seen during attempts to stop or control substance use a	There is persistent desire or unsuccessful attempts to cut down or control substance use a	There is persistent desire or unsuccessful efforts to cut down or control alcohol (or other substance) used
3 2a	Difficulties in controlling substance-taking behaviour – in terms of its onset, termination, or levels of use (loss of control) a	The substance is often taken in larger amounts or over a longer period of time than was intended a	Alcohol (or other substance) is often taken in larger amounts or over a longer period than was intended
4a	Progressive neglect of alternative pleasures because of psychoactive substance use, or increased amount of time necessary to obtain or take the substance or to recover from its effects a	Important social, occupational or recreational activities are given up or reduced because of drinking or psychoactive substance use a	Recurrent alcohol (or other substance) use resulting in a failure to fulfil major role obligations at work, school or home§ a
5a	Subsumed in above criterion a	A great deal of time is spent in activities necessary to obtain the substance, use the substance or recover from its effects. § a	A great deal of time is spent in activities necessary to obtain alcohol (or other substance), use alcohol (or other substance) or recover from its effects
6 a	Tolerance: such that increased doses of the psychoactive substance are required, in order to achieve effects originally produced by lower doses a	Tolerance: as defined by either (a) a need for markedly increased amounts of the substance to achieve the desired effect or (b) markedly diminished effect with continued use of the same amount of the substance a	Tolerance is defined by either of the following: a) a need for markedly increased amounts of alcohol (or other substance) to achieve intoxication or desired effect b) a markedly diminished effect with continued use of the same amount of alcohol (or other substance) § a
7 a	A physiological withdrawal state when substance use has ceased or been reduced, as evidenced by the characteristic withdrawal syndrome for the substance; or use of the same (or a closely related substance) with the intention of relieving or avoiding withdrawal symptoms a	Withdrawal, as manifested by either (a) the characteristic withdrawal syndrome for the substance or (b) the same (or a closely related) substance is taken to relieve or avoid withdrawal symptoms. § a	Withdrawal is manifested by either of the following: a) the characteristic withdrawal syndrome for alcohol (or other substance) § b) Alcohol (or a closely related substance such as barbitolates) (or other substance) is taken to relieve, or avoid withdrawal symptoms
8 a	Persisting with substance use despite clear evidence of overtly harmful consequences a	The substance use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the substance a	Continued alcohol (or other substance) use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of alcohol (or other substance) a
9. § Former DSM-IV abused		Continued substance use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of the substance (e.g., arguments with spouse about consequences of intoxication, physical fights) § a	Alcohol (or other substance) use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by alcohol (or other substance) a
10 Former DSM-IV abused		Recurrent substance use in situations in which it is typically hazardous (drink driving) § a	Recurrent use in situations in which it is physically hazardous
11 Former DSM-IV abused		Recurrent substance use which results in failure to fulfil major obligations at work, school or home § a	Important social, occupational or recreational activities are given up or reduced because of alcohol (or other substance) use a
12 Omitted		Recurrent substance-related legal problems (e.g. driving an automobile or operating a machine when impaired by substance use) a	a

§ In DSM-5 the diagnosis of alcohol (or substance) use disorder is further classified according to severity: §

Presence of 2-3 symptoms: mild; presence of 4-5 symptoms: moderate; presence of 6 or more symptoms: severe §

**Table 2**

**DSM-5 draft Internet Gaming Disorder**

Persistent and recurrent use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress as indicated by five (or more) of the following in a 12-month period:

1. Preoccupation with Internet games ... Internet gaming becomes the dominant activity in daily life
2. Withdrawal symptoms when Internet gaming is taken away e.g. Irritability, anxiety, sadness; no physical signs of withdrawal;
3. Tolerance – the need to spend increasing amounts of time engaged in Internet games.
4. Unsuccessful attempts to control the participation in Internet games.
5. Loss of interest in previous hobbies and entertainment as a result of, and with the exception of Internet games
6. Continued excessive use of Internet despite knowledge of psychosocial problems
7. Has deceived family members, therapists, or others regarding the amount of Internet gaming
8. Use of Internet games to escape or relieve negative mood
9. Has jeopardized or lost a significant relationship, job, or educational or career opportunity because of participation in Internet games.



## **The Concept and Position of Behavioural Addiction in the Classification of Mental Disorders**

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Traditionally, the term addiction has been associated with dependence on psychoactive substances, such as alcohol and other drugs. More recently, addiction has been applied to a range of problematic behaviours such as gambling, internet use and sex to mention only a few. Whether or not behavioural addictions should be treated as "real" addictions is currently under debate. In the two main diagnostic systems of mental disorders, the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) (APA, 1996) and the International Classification of Diseases, Tenth Edition (ICD-10) (WHO, 1992) only pathological gambling is included but is classified as an impulse control disorder. In the Fifth Edition of the DSM behavioural addiction has been suggested as a new class but disordered gambling will be the sole behavioural addiction in this group. Internet addiction will only be included in the appendix (Holden, 2010). The aim of this report is to provide a basis that allows making an informed decision of whether or not behavioural addictions should be merged with substance use disorders (SUDs) and if so, what kind of behavioural addictions should be included in forthcoming ICD-11.

### **I. The concept of addiction**

The term addiction is derived from the Latin verb *addicere*, which referred to a Roman court action of binding a person to another. The term was later used to describe attachment or devotion to an activity. Addiction thereof was used in the 17<sup>th</sup> and 18<sup>th</sup> centuries to refer to use of psychoactive substances (Maddux & Desmond, 2000).

Traditionally, addiction has been defined as repeated use of a psychoactive substance (or substances) to the extent that the user (referred to as an addict) is periodically or chronically intoxicated, shows a compulsion to take the preferred substance (or substances), has great difficulty in voluntarily ceasing or modifying substance use, and exhibits determination to obtain psychoactive substances by almost any means. Typically, tolerance is prominent and a withdrawal syndrome frequently occurs when substance use is interrupted (WHO, 1994).

The core elements of addiction (dependence) according to the diagnostic criteria in ICD-10 are:

1. Loss of control: impaired capacity to control substance-taking behaviour in terms of its onset, termination, or levels of use; persistent desire or unsuccessful efforts to reduce or control substance use; persistent use despite clear evidence of harmful consequences
2. Craving: a strong desire or sense of compulsion to take the substance
3. Tolerance: a need for significantly increased amounts of the substance to achieve intoxication or the desired effect, or a markedly diminished effect with continued use of the same amount of the substance
4. Withdrawal state: a group of symptoms that occurs upon the abrupt discontinuation/separation or a decrease in dosage of the intake of substance

Altered function of the mesocorticolimbic dopamine system (i.e. brain reward system) has been associated with the development of drug addiction. The brain reward system is involved in mediating motivational goal-directed behaviour, reinforcement of reward-related behaviour and learning (Fiorillo et al., 2003; Potenza, 2008). It is activated by natural reinforcers such as food, water, sex and maternal behaviour, thereby reinforcing behaviour necessary for

self-preservation and surviving of the species (Robbins & Everitt, 1996; Wise, 2000). Structurally the reward circuitry consists of highly interconnected cortical and subcortical structures including prefrontal cortex, amygdala, nucleus accumbens (NAc) / ventral striatum, subiculum of the hippocampal formation and the ventral tegmental area (VTA) of the midbrain (Cooper, 2002). Dopaminergic neurons, whose cell bodies are located in the VTA and which project primarily to the NAc are especially relevant for the processing of rewarding stimuli. The NAc also receives efferent glutamatergic projections from the prefrontal cortex, amygdala, and other brain regions that mediate reward processing. Dopaminergic and glutamatergic neurotransmitter systems are widely believed to be important for learning about events that are associated with reward and choosing actions that lead to reward (NIDA, NIMI, NIDDK, 2002). A growing number of recent studies implicate multiple neurotransmitter system in the pathophysiology of addiction including serotonergic, noradrenergic and opioidergic systems.

## **II. The concept and classification of behavioural addictions**

Until recently, non-substance related behavioural addictions were not listed in the two international diagnostic systems of mental disorders, neither in the DSM-IV (APA, 1996) nor in the ICD-10 (WHO, 1992). To date, there is still no consistent concept for diagnosis and treatment of excessive reward-seeking behaviours and their classification is under debate. However, an appropriate classification and a clear diagnosis would allow improving therapeutic prevention and treatment strategies (Albrecht et al., 2007).

### **1. Definition of behavioural addiction**

The term addiction has been linked to dependence on psychoactive substances, such as alcohol, nicotine and other drugs. In the recent past a range of problematic behaviours such as gambling, eating, sex, viewing of pornography, use of computers, playing video games, use of the Internet, work, exercise, spiritual obsession (as opposed to religious devotion), and shopping (Petry, 2006; Holden, 2001) have been labelled with the term behavioural addictions. The term behavioural addiction (also referred to as process addiction (Shaffer, 1996) or non-substance related addiction (Albrecht et al., 2007)) derives from the fact that normal, pleasant activities turn into maladaptive, recurrent behaviours that are frequently executed due to an irresistible urge, drive or impulse that is difficult to control by the individual although the behaviour in such an intensity is harmful to the person and / or others (Grant et al., 2010). Behavioural addiction is a chronically relapsing disorder, characterised by a long-lasting risk of relapse even after long periods of abstaining. Equivalents for substance-related phenomena like withdrawal (Rosenthal & Lesieur, 1992) and tolerance can be deduced for behavioural addictions. Individuals report a dysphoric state if they abstain from the problematic behaviour (i.e. withdrawal). With repeated behaviour positive mood effects decrease or there is a need to increase the intensity of the behaviour to achieve the same positive effects (i.e. tolerance).

### **2. Classification of behavioural addictions: non-substance addiction, impulse control disorder or obsessive and compulsive behaviour?**

A central diagnostic question currently under debate is whether behavioural addictions are resembling substance addictions or whether they share more similarities with either obsessive and compulsive behaviours or impulse control disorders (El-Guebaly et al., 2011; Grant et al., 2010). Historically some of these maladaptive behaviours such as excessive gambling have been conceptualized as impulse control disorders. However, the phenomenological description of addictive behaviours resembles those for substance abuse/dependence, i.e., preoccupation with the behaviour, diminished ability to control the behaviour, adverse psychosocial consequences. Even tolerance and withdrawal-related aspects have been reported for behavioural addictions (El-Guebaly et al., 2011). Additionally, striking similarities have also been reported for natural history (chronic, relapsing course with higher incidence and

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prevalence in adolescents and young adults), comorbidity, overlapping genetic contribution, neurobiological mechanisms (with roles for brain glutamatergic, opioidergic, serotonergic and dopamine mesolimbic systems), and response to treatment (Grant et al., 2010a). Data have mainly be obtained for pathological gambling and pathological computer use (internet addiction) but evidence for other excessive behaviours such as shopping, sex, eating is not sufficient yet to allow any conclusion regarding their possible classification as behavioural addictive disorders.

Although compulsive and impulsive features are present in behavioural addictions they can vary considerably between different types of behavioural addictions (El-Guebaly et al., 2011; Grant, 2010). More studies are needed that assess discrete components of impulsivity and compulsivity in a large and well-defined group of individuals with various behavioural and substance addictions to clarify where behavioural addictions fall on an impulsivity-compulsivity dimension - if they represent a unitary dimensions at all (Grant et al., 2010).

### **3. Behavioural addictions as new category in DSM V: pros and cons**

The recently posted first draft of DSM-V ([www.dsm5.org](http://www.dsm5.org)) has suggested a whole new category of mental disorders entitled "Behavioural Addictions". The category would begin life in DSM-V nested alongside the substance addictions and it would start with just one disorder (gambling). None of the other "behavioural addictions" suggested for DSM-V would gain official status as a stand-alone diagnosis, but could be diagnosed as "behavioural addiction not otherwise specified" and thus receive the dignity of an official DSM code (Frances, 2010).

#### *Contra arguments*

Frances (2010) argued that including behavioural addictions in mental disorder classification systems would raise several problems - some practical, some conceptual, some societal:

1. It would quickly expand to include all impulsive behaviours that lead to trouble. There is no bright line to separate "addiction-driven" from "pleasure-driven" behaviours so "addiction" would widely spread its borders and become ubiquitous.
2. "Behavioural addiction" will likely become the "excuse du jour" for all sorts of past irresponsibility when people get in trouble.
3. Being "addicted" reduces ones sense of personal control over, or responsibility for, future indulgences. "The addiction makes me do it" reduces the burden of personal agency.
4. Medicalized self-indulgence will dramatically swell the rates of mental disorders and turn normality into a vanishing species.

#### *Pro arguments*

In response to this criticism, Balt (2011) argued "that it is impossible to write a comprehensive, scientifically valid catalogue of all mental illnesses" (particularly when some argue convincingly that mental illness is itself a false concept). Thus, the DSM-V, like all DSM's before it, will be, almost by definition, incomplete or deficient. It will be a descriptive tool, taxonomy, guidebook, featuring the authors' best guess as to what might constitute a treatable condition. The danger does not lie in the diagnostic label, but in how we use it. In fact, one might even argue that a lousy label - or a label that is so nonspecific that it applies to a broad swath of the population, including some in the "normal" part of the spectrum (wherever that maybe) - may actually be beneficial, because it will be so meaningless that it will require the clinician to think more deeply about what that label is trying to convey.

Medicalization describes a process by which nonmedical problems become defined and treated as medical problems (Conrad, 1992). The term has been used more often in the context of a critique of medicalization (or overmedicalization) than as a neutral term simply describing that something has become medical. However, if we look back in the history of modern psychiatry, a lot of disease entities were results of so-called medicalization, such as hyperactivity in children, alcohol and drug dependence, eating disorders, post traumatic stress disorder (PTSD), pathological gambling, learning disability etc. The authors argue that if a problem has a clear underline psychopathology and there were effective medical treatments available, medicalization the has advantageous for both, the individual and society.



### III. Major categories of behavioural addictions

In the following, an overview of the most popular and frequently described behavioural addictions is given.

#### 1. Pathological gambling

Pathological gambling was introduced to the third edition of the DSM (DSM-III) (APA, 1980) and ICD-10 (WHO, 1992). Since its first mention the condition was classified as an impulse control disorder.

Over the past 25 years criteria for this disorder have changed, and knowledge has expanded about its etiology, comorbidity and treatment. Despite advances in understanding the disorder important issues remain to be addressed, including its diagnosis, classification and neurobiological underpinnings (Wölfling et al., 2009).

The behaviours that characterise problematic gambling (e.g. chasing losses, preoccupation with gambling, inability to stop) are impulsive in that they are often premature, poorly thought out, risky, and result in deleterious long-term outcomes (Chamberlain & Sahakian, 2007). Deficits in aspects of inhibition, working memory, planning, cognitive flexibility, and time management or estimation are more common in individuals with pathological gambling than in healthy volunteers (Lawrence et al., 2009; Roca et al., 2008). In one neuroimaging study on inhibition in pathological gambling, decreased activation in the ventrolateral prefrontal cortex was reported in problem gamblers compared with healthy controls by use of the Stroop colour–word task (Potenza et al., 2003). Studies of patients, however, can often have confounds, such as treatments received and potential deleterious cognitive effects of comorbidities (e.g., depression). Furthermore, these studies do not enable characterisation of the temporal association between the manifestation of cognitive deficits and clinically significant symptoms. These deficits could occur in people at risk before symptoms develop or could alternatively stem from the disorder itself, perhaps reflecting a secondary or incidental epiphenomenon (Hodgins et al., 2011).

Prevalence rates for pathological and problem gambling from national surveys vary worldwide. For example, past 12-month rates of problem gambling range from 0.2% in Norway to 5.3% in Hong Kong (Wardle, et al., 2007). Reported rates of pathological gambling in the USA range from 0.4% to 1.1% of adults, with an additional 1–2% identified as problem gamblers. Data from prevalence surveys indicate variability in rates of gambling disorders not only from differences in survey methods—such as the use of different screening techniques, timeframes (e.g. reported past year problems, lifetime problems), administration format, and response rates (Williams & Volberg, 2009) but also as a result of variability associated with the availability and accessibility of gambling opportunities. However, in some cases, national prevalence rates are stable over time despite an increase in gambling opportunities, suggesting that some type of social adaptation might take place as gambling becomes less novel in a local environment (Shaffer et al., 2004).

Gambling disorders are highly comorbid with other psychiatric disorders (Petry, 2006). The strongest evidence relates to substance use disorders. In NESARC, the largest psychiatric epidemiology study undertaken so far, pathological gamblers had an increased risk of having a diagnosis of alcohol misuse in their lifetimes by a factor of six, and an increased risk of having a substance use disorder by a factor of 4.4 compared with non-gamblers. Additionally, rates of major depression and dysthymia were each about three times higher in pathological gamblers than in non-gamblers, whereas rates of a manic episode were eight times higher in gamblers. Moreover, generalised anxiety disorder, panic disorder, and specific phobias were each more than three times higher in gamblers, with social phobia twice as high a risk. Modules for obsessive-compulsive and post-traumatic stress disorders were not included in the NESARC study, and evidence for the comorbidity between those disorders with pathological gambling in other published studies is mixed. In the NESARC sample, pathological gamblers also had an increased risk of having a personality disorder by a factor of about eight (Petry, 2005). In another large-scale U.S. national survey of mental disorders - the National Comorbidity Survey Replication (NCS-R) - similar comorbidity rates of pathological gambling with psychiatric disorders were obtained. Of those with pathological gambling, the risk of having a substance

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use disorder was increased by 5.5 times, that for having a mood disorder was increased by a factor of 3.7, and that for having an anxiety disorder increased by 3.1. Although the bi-directionality between pathological gambling and psychiatric disorders is unclear, the NCS-R was the first study to obtain retrospective onset data, indicating that in pathological gamblers with a comorbid disorder, the onset of pathological gambling preceded the comorbid disorder 23.5% of the time, whereas pathological gambling followed the comorbid disorder 74.3% of the time. Results from the NCS-R also suggested that mood and anxiety disorders predicted the subsequent onset of pathological gambling. With regard to substance use disorders, pathological gambling more often predicted the subsequent onset of substance use disorders than vice versa (Kessler et al., 2008).

Increasing evidence implicates multiple neurotransmitter systems (e.g., dopaminergic, serotonergic, noradrenergic, opioidergic) in the pathophysiology of gambling disorders. Dopamine is implicated in learning, motivation, and mediates the salience of stimuli, including rewards. Alterations in dopaminergic pathways might underlie reward seeking behaviours (i.e., gambling) that trigger the release of dopamine and produce feelings of pleasure (Zack & Poulos, 2009). Neuroimaging research suggests that the dopaminergic mesolimbic pathway from the ventral tegmental area to the nucleus accumbens might be involved in pathological gambling. Neuroimaging studies in pathological gamblers have indicated diminished ventral striatum and ventromedial prefrontal cortex and ventrolateral prefrontal cortex activity during rewarding events suggesting a blunted neurophysiological response to rewards and losses (Reuter et al., 2005; De Ruiter et al., 2009). Contrary to what might be expected from dopamine involvement, antagonists at dopamine D2/D3 receptors enhance gambling-related motivations and behaviours in patients with pathological gambling and have no effect in the treatment of pathological gambling (Fong et al., 2008). Further research is needed to clarify this discrepancy. Evidence for serotonergic involvement in pathological gambling comes from preclinical research examining the effect of a serotonergic agonist in rats undertaking a gambling task (Zeeb et al., 2009). A serotonergic agonist resulted in an inability to judge between expected outcomes on the basis of the relative likelihood and size of rewards and punishments (Zeeb et al., 2009). Other support for dysfunction within the serotonergic system comes from human studies of pathological gamblers: decreased concentrations of platelet monoamine oxidase B (a peripheral marker of serotonergic function), low concentrations of serotonin metabolites (e.g., 5-hydroxyindoleacetic acid) in the cerebrospinal fluid, and a euphoric response to pharmacological challenges with serotonergic agonists (Potenza, 2001).

Since the inception of pathological gambling in DSM, the criteria have been specifically modelled after psychoactive substance dependence criteria (Lesieur & Rosenthal, 1991). Most recently, the Substance Use Disorders Workgroup of the American Psychiatric Association DSM committee (APA, 2010) has proposed several changes to the current DSM-IV classification of pathological gambling and has received more than 400 comments on their proposed changes (Petry, 2010). First, the Workgroup has proposed to rename the pathological gambling disorder to disordered gambling and to reclassify the disorder from the section on impulse-control disorders not elsewhere classified into substance-related disorders (which is to be renamed as addiction and related disorders). To buttress their proposal, the Workgroup has cited 21 papers that take into account commonalities between pathological gambling and substance use disorders with regard to clinical expression, cause, comorbidity, biological dysfunction, genetic liability, and treatment. Most of the comments received by the Workgroup were in favour of moving pathological gambling to a section on addiction and related disorders (Petry, 2010). Second, with regard to diagnostic criteria, the Workgroup has proposed to eliminate the criterion "has committed illegal acts such as forgery, fraud, theft, or embezzlement to finance gambling". Although the Workgroup lists only one study to support this proposal, other research indeed supports the notion that the illegal acts criterion is rarely endorsed in population surveys and adds little to classification accuracy. The final recommendation of the Workgroup is to lower the threshold necessary for a diagnosis of pathological gambling, whereby an individual would need to meet four or more of nine diagnostic criteria (rather than five or more, as specified in DSM-IV). The Workgroup has cited three studies in support of lowering the current threshold to improve classification accuracy. Some comments received by the Workgroup suggested to reduce the number of criteria necessary for a diagnosis to even lower than four. However, such changes would more than double the prevalence rate of the disorder which then could set precedence for setting the level too low for future putative behavioural addictions that might be introduced in subsequent

versions of the DSM. Also this would in a broader sense undermine the system of psychiatric classification and serve as a disservice to individuals with substantial psychiatric distress (Petry, 2010; Hodgins et al., 2011).

## **2. Internet addiction**

Internet addiction (problematic Internet use, virtual addiction, pathological Internet use, pathological computer use and compulsive Internet use) is characterized by excessive or poorly controlled preoccupations, urges or behaviours regarding Internet use that lead to impairment or distress. The condition has attracted increasing attention in the popular media and among researchers, and this attention has paralleled the growth in computer use and Internet access. Phenomenological there appear to be at least three subtypes: excessive gaming, sexual preoccupations (cybersex), and e-mail/text messaging. Addicts may use the Internet for extended periods, isolating themselves from other forms of social contact, and focus almost entirely on the Internet rather than broader life events. Increasingly, addiction to mobile devices, such as mobile phones and smartphones, and addiction to social networking sites, such as Facebook, are being investigated. There may be overlaps between each of these sub-types - for example, online gambling involves online games, and online games may have elements of pornography (Weinstein & Lejoyeux, 2010).

The diagnosis of Internet addiction remains problematic. It does not appear in any official diagnostic system including ICD-10 and DSM-IV, and there are no widely accepted diagnostic criteria. The most commonly used questionnaire for diagnosing Internet addiction is Young's Internet Addiction Scale (IAT), which has been validated in the United Kingdom, the United States, Finland, and Korea. The internet addiction diagnostic criteria proposed by Tao et al. (2010) and Liu's (2006) Internet dependence diagnostic criteria are used in China. The Chen Internet Addiction Scale (CIAS) has been widely used in Taiwan. The Questionnaire of Experiences Related to Internet has been validated in Spain, the Compulsive Internet Use Scale (CIUS) in Holland, and the Problematic Internet Use Questionnaire (PIUQ) in Hungary. These instruments are based on different theoretical underpinnings and do not agree on the underlying dimensions that make up problematic Internet use (Weinstein & Lejoyeux, 2010).

In Germany, an estimated 1.5 million people, i.e., 3% of the German population is believed to be at risk of Internet addiction (Weinstein & Lejoyeux, 2010). The rate of problematic Internet use in Italian adolescents was 5.4% (Pallanti et al., 2006). Using the Pathological Internet Use (PIU) scale in British students, 18.3% were considered to be pathological Internet users (Niemz, et al., 2005).

Internet addiction has been most studied in Asia. A Chinese study using the IAT scale found that, among responders aged 13 to 18 years, 10.2% used the Internet moderately and 0.6% was severely addicted (Lam et al., 2009). Prevalence rates of Internet addiction range from 6.44% in Shaanxi Province in China (Ni et al., 2009) to between 2.4% and 5.5% in Hunan province in China (Deng et al., 2007; Cao et al., 2007). Among Taiwanese university freshmen, 17.9% were addicted to the Internet (Tsai et al., 2009). Among Korean middle school students, 16% were potential at-risk users and 3.1% were high-risk users (Seo et al., 2009). Other studies in Korea have found 4.3% (Jang et al., 2008), 10.7% (Park et al., 2008), 20.3% (Ha et al., 2007), 1.6% (Kim et al., 2006), and 3.5% (Whang et al, 2003) of adolescents diagnosed with Internet addiction. The main difficulty with these studies is that they use vague terms to describe levels of Internet use, such as "borderline," "excessive," "at risk," and "addictive," which are not operationally defined or clinically validated (Weinstein & Lejoyeux, 2010).

Cross-sectional studies on samples of patients report high comorbidity of Internet addiction with psychiatric disorders, such as affective disorders, anxiety disorders (including generalized anxiety disorder, social anxiety disorder), and attention deficit hyperactivity disorder (ADHD) (Weinstein & Lejoyeux, 2010).

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Comorbidity with hypomania, dysthymia, obsessive compulsive personality disorder, borderline personality disorder, and avoidant personality disorder was found in U.S. adolescents (Bernardi & Pallanti, 2009). A combination of alexithymia, dissociative experiences, low self-esteem, and impulse dysregulation were suggested as-risk factors for Internet addiction in a sample of Italian adolescents (De Berardis et al., 2009). There was a significant association between Internet addiction and depressive symptoms in South Korean adolescents (Ko et al., 2005), along with high levels of depression and suicidal ideation (Kim et al., 2006). Adolescents with Internet addiction had higher ADHD symptoms, depression, social phobia, and hostility in Taiwan (Yen et al., 2007). Higher ADHD symptoms, depression, and hostility are associated with Internet addiction in male adolescents, and only higher ADHD symptoms and depression are associated with Internet addiction in female students. Internet addiction and impulsivity were associated with adult ADHD, and the association between attention deficit and Internet addiction was more significant among female Taiwanese college students (Yen et al., 2009a). Finally, an association was found between Internet addiction and harmful use of alcohol among Taiwanese students (Yen et al., 2009; Ko et al., 2008). It is unknown whether Internet addiction and these comorbid disorders could be explained by shared risk factors or are best considered as secondary disorders. Liu (2005) studied 62 patients (60 male, 2 female) with "Internet addiction disorder" in Internet Special Clinic in China and found 22 cases (35.5%) with depression (mild to moderate), 8 cases (12.9%) with borderline personality disorder, 2 cases (3.2%) with schizophrenia.

Currently, there have been very few studies on the neurobiology of Internet addiction. Among the first brain imaging studies (Ko et al., 2009) has reported 10 participants with online gaming addiction who were presented with gaming pictures and the paired mosaic pictures while undergoing functional magnetic resonance imaging (fMRI) scanning. In the addicted group, right orbito-frontal cortex, right nucleus accumbens, bilateral anterior cingulate and medial frontal cortex, right dorsolateral prefrontal cortex, and right caudate nucleus were activated in contrast to the control group. The activation of the regions-of-interest (ROI) was positively correlated with self-reported gaming urge and recalling of gaming experience provoked by the pictures. The results demonstrated that the neural substrates of cue-induced gaming urge/craving in online gaming addiction was similar to that of the cue-induced craving in substance dependence. Thus, the results suggested that the gaming urge/craving in online gaming addiction and craving in substance dependence might share the same neurobiological mechanism.

In spite of the progresses, Internet misuse related problems are still poorly understood in the following areas:

1. Definition: It is very difficult to define the Internet related addiction problem. Some defined it as an impulse control disorder and akin to pathological gambling (Young, 1999) while other consider it as substance-like addiction (Liu, 2005). There are various names for the problem, such as Internet addiction disorder, Internet abuse, virtual addiction, pathological Internet use, pathological computer use and compulsive Internet use. There is a need for the professional community to recognize and respond to the reality of Internet addiction and the threat of its rapid expansion (Liu et al., 2004a).

2. The nature of the problem: There are probably two types of Internet use related problems: There is a primary problem in which the Internet itself becomes the focus on the compulsive pattern. The secondary problem refers to pre-existing psychiatric problems that might closely be related to, or exacerbated by the internet use (Shaffer, 2004). These psychiatric problems include personality disorders, anxiety disorder, depression, bipolar disorders, substance dependence, compulsive control disorder, pathological gambling, eating disorders etc. (Shaffer, 1996).

3. The extent of the problem: Much of the original research was based upon the problematic type of research methodology, began with exploratory surveys, which cannot establish causal relationships between specific behaviours and their cause. While surveys can help establish description of how people feel about themselves and their behaviours, they cannot draw conclusions about whether the Internet has actually caused those behaviours. Almost all

surveys were conducted based on self-selected data from websites and there are very few epidemiological surveys in community. The obvious confounds are not controlled for in most surveys, such as pre-existing mental disorders (Gorhol, 1999).

4. Natural course and treatment outcomes: In a meta-analysis, Byun and his colleagues (2008) demonstrated that there have been only a few longitudinal surveys on the natural course of Internet addiction and treatment outcomes. They criticised that previous studies utilized inconsistent criteria to define Internet addicts, applied recruiting methods that may cause serious sampling bias and examined data using primarily exploratory rather than confirmatory data analysis techniques to investigate the degree of association rather than causal relationships among variables.

5. The position in the classification system of mental disorders: There is considerable controversy with respect to the so-called Internet addiction and whether it ought to be classified in the DSM-V. The relationship between "addiction" and various compulsive or impulsive behaviours is also a source of confusion. Some psychiatrists have argued that Internet addiction shows the features of excessive use, withdrawal phenomena, tolerance, and negative repercussions that characterize many substance use disorders.

6. Another concern about including Internet addiction in the mental disorder classification system is the medicalization of pleasure-seeking or impulsive behaviour (such as "addicted" to sex, shopping, food, video games, Internet, excessive working, credit card spending, surfing etc.) which is a ubiquitous part of human nature. Potentially millions of new "patients" would be created by fiat, medicalizing all manner of impulsive, pleasure seeking behaviours and giving people a "sick role" excuse for impulsive irresponsibility (Frances, 2010).

Even though there is still disagreement about whether Internet addiction is a real diagnosis and should be included in international classification system, there is no doubt that the compulsive use of the Internet, like other dependencies, has material as well as psychological dangers. "Addicts" can lose their jobs as they become unable to limit their time spent online, either because they fail to turn up for work or because they misuse their office computer facilities. And there is no doubt that the opportunities for compulsive Internet use are broadening. Today, a computer is no longer necessary - services like WebTV mean a television will do just as well. And added "attractions" such as Internet gambling sites and Internet shopping may be the bait that will draw yet more potential addicts into the Internet's web. Even the experts do not feel safe from Internet addiction (Mitchell, 2000).

To sum up, Internet has changed million people's life styles and promises new and better ways of communication. However, misusing the Internet causes many health and social problems, which can be similar to that of alcohol and drug addition, compulsive gambling and merit our professional care and treatment. Carefully controlled studies are required to settle these controversies (Pies, 2009).

### **3. Shopping addiction**

Shopping addiction, also known as compulsive shopping, compulsive spending, compulsive buying or oniomania has been recognized for the past 100 year (Frances et al, 2005). Although there is a growing awareness of the need to help people who suffer from financial hardship as a result of compulsive shopping, it is neither currently listed under the proposed new behavioural addictions, nor is it present as a disease entity in mental disorder classification systems.

O'Guinn and Faber (1989) did a pilot study distributing a battery of questionnaires to 388 people who had written to a support group for compulsive buyers and to 292 adults who were contacted randomly via mass mailing. In analysing responses to questionnaire items across groups, O'Guinn and Faber (1989) found that self-identified problem buyers reported greater debt and adverse social consequences as a result of their shopping behaviours than individuals who did not complain of compulsive shopping habits. Based on their research,

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O'Guinn and Faber (1989) asserted that a four-step cycle, dubbed, "the compulsive shopping cycle", characterized the experience of compulsive shoppers. The compulsive shopping cycle consisted of: (1) a general pre-disposition towards feelings of anxiety and low self-esteem that appeared to worsen directly before urges to shop; (2) impulsive shopping episodes, typically accompanied by feelings of "elation" or "intoxication"; (3) guilt and remorse following shopping episodes and (4) a renewed impulse to shop, in part to escape feelings of low self esteem, anxiety, and guilt that had been exacerbated during the shopping episodes. Based on these findings, in the conclusion of their paper, O'Guinn and Faber (1989) argued for an emergent definition of compulsive shopping disorder as, "chronic, repetitive purchasing that becomes a primary response to negative events or feelings, becomes very difficult to stop, and that ultimately results in harmful consequences" (O'Guinn & Faber, 1989, p. 155).

Based on these findings as well as O'Guinn and Faber's (1989) work, a clinical screening tool for compulsive buying (CBS) was developed (Faber & O'Guinn, 1992) to identify compulsive shoppers, it is estimated that between 1.4% and 16% of the adult U.S. population meet the CBS's criteria for compulsive shopping disorder, with females outnumbering males by as many as 9 to 1 (Faber & O'Guinn, 1992; Koran et. al. 2006).

A number of investigators have conducted studies on comorbidity of mental disorder. It is estimated that 25-50% of individuals who meet criteria for compulsive shopping disorder also meet criteria for depression (Christensen et al., 1994; McElroy et al., 1994; Schlosser et al., 1994); 21-30% meet criteria for an anxiety disorder (Christensen et al., 1994; McElroy et al., 1994; Schlosser et al., 1994); 4-35% meet criteria for obsessive-compulsive disorder (Christensen et al., 1994; McElroy et al., 1994; Schlosser et al., 1994) and 10-45% meet criteria for a substance abuse disorder (Christensen et al., 1994; McElroy et al., 1994; Schlosser et al., 1994).

Although compulsive shopping disorders have historically been classified as an impulse-control disorder (McElroy et. al, 1994), some researchers argue that the disorder is more closely related to obsessive-compulsive disorder (McElroy, Philips & Keck, 1994), while others argue its features most closely resemble addictive disorders (DeSarbo & Edwards, 1996). Research by Croissant and colleagues (2009) shows that compulsive shopping activates a "reward loop" that is similar to that of a substance dependency. This reward cycle is a psychological process that is fundamental to arguments supporting the idea of a common addictive process underlying a range of excessive behaviours.

An argument against the concept of compulsive shopping addiction is the idea that problems with spending are the result of poor money management skills arising from a lack of good financial awareness, combined with a lack of awareness of the power of advertising to influence buying behaviour. Credit counseling is often offered as a means of overcoming problems with over-spending, and seeing compulsive shopping as an addiction may fail to take into account the need for more appropriate financial education to be provided to shopping addicts and to the community as a whole (Goldman, 2000).

#### **4. Food addiction**

Food addiction is not currently recognized in ICD-10 or DSM-IV, and there is no agreement among experts on whether it should be included in future editions. However, binge eating disorder has been proposed as a new stand-alone disorder in the fifth edition of the DSM under the category of Feeding and Eating disorder.

Binge eating is also a symptom of bulimia nervosa. The main difference between binge eating disorder and bulimia nervosa is an inappropriate compensatory behaviour in order to prevent weight gain, such as self-induced vomiting, misuse of laxatives, diuretics, or other medications; fasting or excessive exercise (Eating Disorders Work Group on DSM-5, 2011).

The health problems caused by obesity are well recognized, and great efforts are being made to educate the community on the need for a healthy diet and regular exercise. However,

whether the addictive nature of eating will be embraced by the medical profession remains elusive.

## **5. Interim summary**

The data available to date seem to be sufficient to justify listing pathological gambling and maybe also pathological computer use in the upcoming ICD-11 as stand-alone diseases. Evidence for other excessive behaviours such as shopping, sex and eating is not sufficient yet to allow any conclusion regarding their possible classification. However, these excessive behaviours need clinical consideration as they clearly have a huge impact on an individual's well-being. Therefore, they could be classified in the upcoming ICD-11 as other behavioural addictions that deserve clinical attention

## **IV. Terminology issues**

### ***Addiction or dependence?***

In 1964 a WHO Expert Committee introduced the term dependence to replace the terms addiction and habituation. The ICD-10 defines the dependence syndrome as being a cluster of physiological, behavioural, and cognitive phenomena in which the use of a substance or a class of substances takes on a much higher priority for a given individual than other behaviours that once had greater value. A central descriptive characteristic of the dependence syndrome is the desire (often strong, sometimes overpowering) to take the psychoactive drugs (which may or not have been medically prescribed), alcohol, or tobacco. There may be evidence that return to substance use after a period of abstinence leads to a more rapid reappearance of other features of the syndrome than occurs with nondependent individuals (WHO, 1992).

Ironically, arguments have been forwarded to move toward the use of addiction rather than the current term dependence given confusion over different definitions of dependence. For example, physical dependence can be achieved upon chronic administration of a drug (e.g. a beta-blocker for hypertension) and can include aspects of tolerance and withdrawal but is generally not associated with the harmful effects of an addiction (e.g. drug-seeking and drug-using that interferes with major areas of life functioning—see definition of core elements of addiction in the next paragraph). In other words, a change in terminology might shift the focus of the disorder from chronic use of a substance and the associated physical dependence to the harmful effects of the addictive process on the individuals, their friends, families, society, etc. Thus, more precise terminology might help to reduce controversy over such interventions as methadone maintenance that are associated with physical dependence but reduce the impact of addiction, and follow the shift of the DSM-III away from aspects of physical dependence as the core features of substance dependence (Potenza, 2006).

Therefore, we suggest replacing the term drug dependence by drug addiction in the upcoming ICD-11. Possible suggestions for the “parent category” of behavioural addictions are (1) Substance (or substance-related) and non-substance addictions or (2) Substance and behavioural addictions.

### ***Pathological or problematic gambling?***

The concept of problem gambling is broader than that of pathological gambling. We suggest sticking to the term pathological gambling for several reasons: By using the term pathological we avoid softening the diagnosis criteria as we focus only on behaviour that has become dysfunctional to the individual. For the same reasons we do not suggest to reduce the number of diagnostic criteria. Otherwise we are running the risk that the diagnosis is used in an inflationary way which would artificially increase the number of cases. Also all types of excessive behaviours even if they are not pathological in an medical sense would be classified as addiction which would reduce the responsibility on the individual to change his/her behaviour. Another advantage is that the term pathological gambling is already well known in the scientific community.

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***Pathological computer use or internet addiction?***

We suggest using the term pathological computer use instead of internet addiction as the condition involves online and/or offline computer usage. The term pathological implicates that it is a disease thereby we again we avoid softening the diagnostic criteria.



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